Vol. XLVII

MAY 10th, 1945

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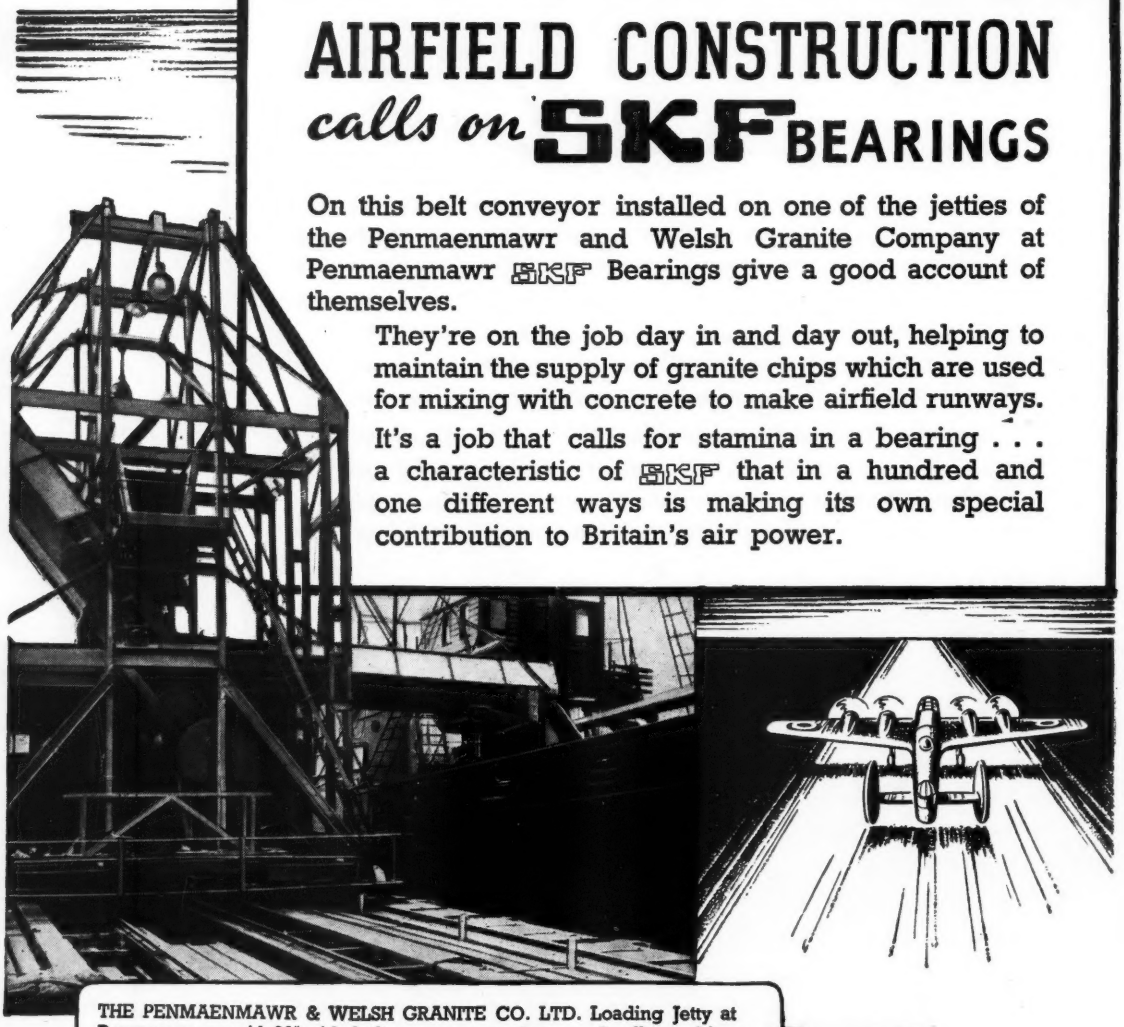

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and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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VICTORY

THE day to which millions have been looking forward has arrived. Hostilities in Europe have to all intents and purposes ceased. For over a month past there has been no enemy air action against Great Britain. Bomber Command has beaten its sword (i.e. bombs) into the ploughshare of canisters of food, which it has been dropping among the starving people of Holland—"The best bombs I ever dropped," as one pilot remarked.

This has been the first war in which air power has played a part equal in importance to that of land power and sea power. The main lessons which it has taught are that the secret of success is combined operations in which all three Services take their due share, and that it is well to have one Supreme Commander in each theatre who co-ordinates the work of all three.

Bombers when well handled have shown a tremendous power of destruction. Badly handled, as were those of the Luftwaffe in the Battle of Britain, they were almost futile. For a long period only the Russians were able to engage the German armies, but during that time the Air Forces of Britain and anon the United States steadily bombed German production centres. At first only comparatively small numbers were available, and they could only drop comparatively light bombs. But the numbers and carrying power of our bombers gradually increased, and so did the destructive power of the bombs, until at last crippling blows were struck at German war industries and strategic centres. Finally the destruction of German fighter factories, the denying to the enemy of supplies of oil, and the widespread paralysis of communications, made possible the invasion of Europe in the West. Then the heavy bombers showed their versatility by taking part in tactical operations.

We British may plume ourselves on the development of Tactical Air Forces which worked with the Army. We started the war very much behind both the Germans and the Russians in that respect; but in Libya we learned how to develop and to use this new arm. We and the Americans ended up ahead of everybody in this novel way of beating the enemy with a minimum loss of life in our own armies.

High, Fast and Heavy

ALTHOUGH we have come to the end of the strategic air war in Europe, the development of the very fast, high-flying bomber, carrying one super-size missile, must go on.

In the 1914-18 war we—alone of the belligerents—developed the big bomb, but we neglected it in the years between the wars. Our pre-war heavy night bombers, Virginias and such-like, were designed to take nothing heavier than a number of 500 lb. bombs. This break in continuity of development must not occur again.

A peep into the possibilities of the not very far distant future is intriguing. What is wanted is a small component of very large jet-propelled bombers able to operate in the region of 50,000ft., each carrying one 15-ton bomb. Bomb-aiming by instrument is already more accurate than the visual variety, and it should not be beyond the bounds of possibility to make it accurate for altitudes up to 50,000ft.

Such aircraft would be extremely difficult to radio-locate and they would be entirely out of earshot. Even if they *were* located, what hopes of interception, or successful anti-aircraft gun defence, are there at such

heights, and with the aircraft travelling at something like 700ft. per sec.? Suitable targets would be manifold. No factory—even underground—no dockyard and no ship at sea would be safe from 15 tons of explosive arriving unheralded at any hour of the day or night.

If the foregoing appears fantastic, remember this: When the D.H. Comet was produced in 1934 it was suggested that to form a super bomber force a number should be built, each to carry one 500 lb. bomb at 230 m.p.h. at 18,000ft. That suggestion was turned down, but the Mosquito—the direct development of the Comet—carrying a 4,000-pounder and nearly twice as fast, and at 30,000ft., has become one of the great weapons of this war. The degree of development required for this next step is no greater in scale than the difference between the Comet and the Mosquito.

Cargo Aircraft

DESIGNERS and operators alike will be interested in the very thorough study of cargo aircraft by Dr. Nebesar which we bring to a close in this issue. Starting with three engine sizes he limits the number of engines to two per aircraft and then examines the relative efficiencies of three general groups of machines, evaluating the effects in each group of changes in wing loadings and power loadings, but keeping the product of wing loading and power loading constant at the value of 300 suggested by Dr. Edward P. Warner.

From an examination of these twelve aircraft, ranging in gross weight from 18,000 lb. to 105,000 lb., Dr. Nebesar arrives at the conclusion that not only the best load-carrying performance but also the greatest efficiency is achieved when the wing loading lies between 20 and 26 pounds per square foot and the corresponding power loading between 15 and 11.5 pounds per h.p.

In this connection it is interesting to recall the article on cargo aircraft by Mr. W. S. Shackleton, published in our issues of February 8th and 15th of this year. For the Bristol Freighter, type 170, he gave the take-off power loading as 12.8 pounds per horse-power, and the wing loading as 21.3 pounds per square foot. Both these figures fall within Dr. Nebesar's range.

Another interesting feature of both Mr. Shackleton's article and Dr. Nebesar's study is their search for an "efficiency factor" relating to operating cost. The latter suggests that a combination of two previously suggested formulæ would give a fair evaluation. At this point, however, the two studies cease to be strictly comparable, due to the fact that in the United States petrol is cheap (Dr. Nebesar uses the value 15 cents per gallon), while in most other countries of the world it is a good deal more expensive. Thus, in any likely British aircraft intended for operation on Empire routes, for instance, Dr. Nebesar's conclusions as to fuel cost would be likely to be far too low (he assumes it to be 25 per cent. of the total flying and operating cost for 500 miles' range). Mr. Shackleton assumes a cost of 1s. 6d. per gallon, and in his estimate of operating costs of the Bristol Freighter the fuel cost works out at £5 5s. per hour, out of a total operating cost of £18 6s. per hour, or nearly 29 per cent. Even the figure of 1s. 6d. per gallon is, in our opinion, much too low. Petrol may be obtainable at that price on some routes, but we believe the average cost will be a good deal higher.

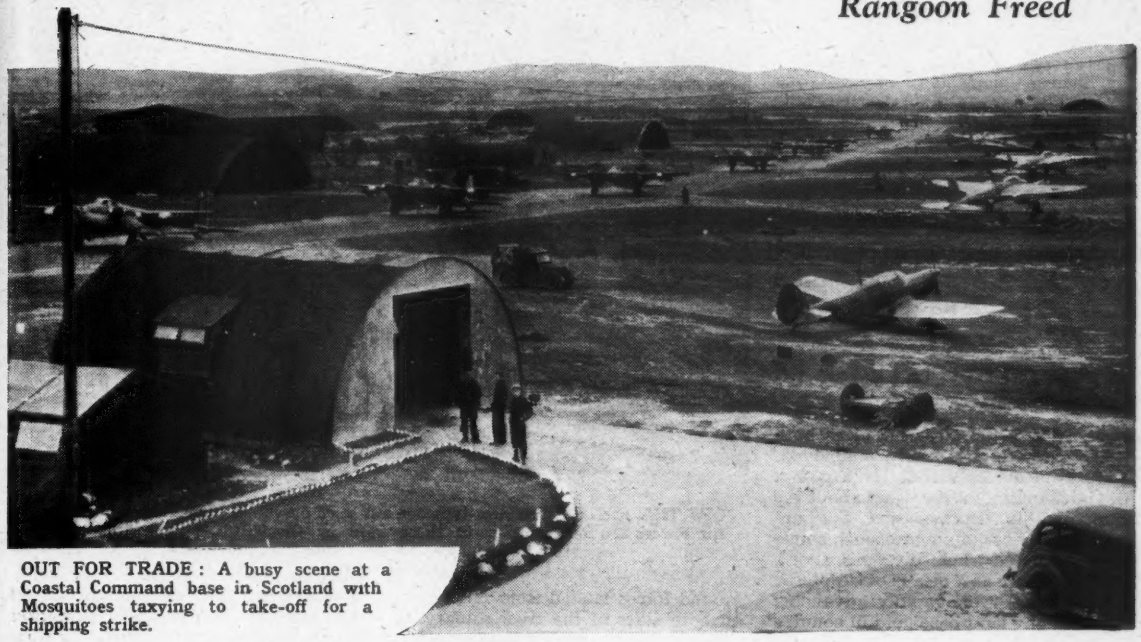
CONTENTS

The Outlook	491
War in the Air	493
The Bombers' Record	495
Here and There	496
Heinkel He 177	498
Swiss Planning	501
Cargo Aircraft	502
Grading the Amateur	508
In Spite of Difficulties	510
Civil Aviation News	511
Correspondence	513
Service Aviation	514

CANCELLED CONTRACT: Derelict Me 109s in the much-bombed Focke-Wolf factory at Bremen. As the *Luftwaffe* supply position became worse and worse, aircraft repair and overhaul were carried out in any factory available.

WAR in the AIR

Good News Comes Thick and Fast: Air Offensive Nears Its End: Bombers Feeding Holland: Rangoon Freed

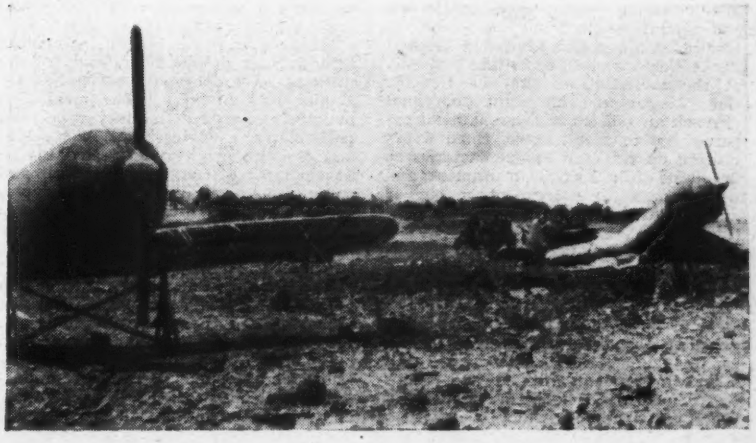


OUT FOR TRADE: A busy scene at a Coastal Command base in Scotland with Mosquitoes taxying to take-off for a shipping strike.

WITH good news coming from all parts of the Western Front almost faster than one can assimilate it, the task of recording the air side of the war in Europe becomes difficult. The death of Hitler, presuming that he really is dead, would a month ago have seemed the biggest and best of all news. When he survived the bomb plot some time ago *Flight* expressed its satisfaction that the competent German Generals were not to be relieved of the necessity of obeying a Führer whose intuitions had led so many German armies into disastrous positions. But in the last stages this utility of Hitler to the United Nations ceased to be effective. Göbbels may have disappeared also into tracts unknown; but, if so, the fact seems relatively unimportant.

Then Berlin fell to the Russians after a comparatively short but fiercely fought siege, and on May 2nd the aircraft ceased to whirl and dive in combat over the doomed German Capital. Its capture is valuable to the Allies from many points of view; but as a purely military piece of news the surrender of all the German forces in Italy stands by itself. Even the fall of Hamburg to the British is of less importance. It has fallen to the lot of that very great commander, Field Marshal Sir Harold Alexander, to achieve the two greatest and most complete victories of this war—Tunisia and Italy. In each case a very large German Army, with its Commander-in-Chief and his staff, surrendered to this British leader, helped in the latter instance by his very competent assistant, the American General Mark Clark. The campaign in Italy was one in which the terrain did not permit the air superiority of the Allies to tell so heavily as it did in Normandy and elsewhere. If it is not too ungracious at this moment to look for spots on the sun, one may even question whether the use of bombers to destroy Cassino was a proper use of air power. But all's well that ends well. From Alamein onwards, the British, with contingents from many other nations, have won every battle, including the last. That rather upsets another old saying; and if it is still to have force we must cast our eyes back to the campaign in the Low Countries which ended at Dunkerque.

Now our eyes are drawn to the Far



TO BAMBOOZLE: Japanese dummy aircraft, made of bamboo, found on the Katena airstrip when the airfields on Okinawa were captured. The dummy on the right presumably appeared in a "game" book as "Destroyed on the Ground."

TOLL OF AXIS AIRCRAFT

R.A.F.

THE Air Ministry has issued the following statement on the number of enemy aircraft destroyed by the R.A.F., and R.A.F. losses from the beginning of the war up to April 28th this year:—

HOME-BASED COMMANDS

Axis aircraft destroyed by R.A.F.:—	
By Bomber Command	759
By Fighter Command in defensive and offensive operations	6,977
By Coastal Command	175
Total	7,911
R.A.F. Losses:—	
Bomber Command	7,997
Fighter Command (in offensive and defensive operations) ..	2,998
Coastal Command	454
Total	11,449

WAR IN THE AIR

East. There the air, as well as both other Services, is fully employed. Future historians will surely say that the outstanding military fact about the campaign in Burma was the unprecedented use of air transport, sometimes to move whole divisions about, but even more as a means of supplying armies which were rapidly advancing far from any land base, and in country where communications by rail and road were of the most meagre. As the date for the breaking of the monsoon drew near, the campaign assumed the form of a race for Rangoon. Would the 14th Army beat the monsoon?

Then, at last, Admiral Mountbatten found himself in the position for which he had hoped when he first took over the supreme command. He was able to use his experience of combined operations to land a force to the south of Rangoon. It was preceded by dropping parachute troops, and then ground forces landed from H.M. ships on both sides of the river estuary.

Some of Gen. Slim's troops made a terrific dash forward and linked up with the parachutists, and Rangoon was occupied. The monsoon was beaten, and with the occupation of this great port the main part of the conquest of Burma was completed. The operation was a copy-book example of the proper use of parachutists in combination with other forces.

OFF THE RAILS: The new-type rockets used by the American Naval and Army Air Forces are very similar to those used by the R.A.F. They are launched from rails instead of from tubes, as previously.

"Well Done"

THE surrender to Field Marshal Alexander in Italy was speedily followed by the surrender of all the Germans in Holland and Denmark to Field Marshal Montgomery. This was another very big event. It has evoked messages to the work of the Tactical Air Force from two high authorities. Air Marshal Sir Arthur Coningham has said to 2nd T.A.F.:—

"We have had the main air front during recent weeks and operations have reached a quite exceptional level of brilliance. 83 Group has dealt with the main opportunities, and all R.A.F. shares in the glory of this great finish to 12 months of the biggest air effort. Peace on our front, May 5th, is a direct and fitting tribute to your work, shared with our R.A.F. Commands and those great airmen, the U.S.A.A.F. A thousand times well done."

Air Vice-Marshal E. C. Hudleston, A.O.C., 84 Group, R.A.F., 2nd. T.A.F., has received the following message from General Crerar, Commander-in-Chief, First Canadian Army: "On behalf of all ranks I desire to express our admiration and appreciation of the magnificent support to the First Canadian Army by 84 Group of the Royal Air Force throughout the operations in north-west Europe, now concluding in outstanding victory. This Army-Air combination has had to face, and solve, some tough operational problems, but with the fine team work of our respective headquarters and the skill, gallantry and determination which all ranks of 84 Group, R.A.F., have consistently demonstrated in action, we have always accomplished what we set out to do."

FRENCH AIR MISSION VISITS BRITAIN

WITH the object of re-establishing the French aircraft industry and manufacturing British types of aircraft and aircraft engines and equipment in France, an air mission headed by General Henri Ziegler arrived in Britain last week at the invitation of the Government. Gen. Ziegler and his eight colleagues (French air officers and aeronautical experts) are to spend about three weeks visiting aircraft and engine factories as the guests of the British Government, and will then go to America on a similar mission at the invitation of the U.S. Government.

The French air mission flew to this country and were welcomed on arrival at a London airport by Air Marshal Sir Ralph Sorley and Sir Eric Bowater, of M.A.P. Later they attended a reception given by Sir Stafford Cripps in London, where they met Mr. Lennox Boyd and other Government officials and senior R.A.F. officers. Among the guests, also, was Capt. Jullerot, Chief of Staff to Admiral Robert, who commands the French Naval Forces in Britain. Capt. Jullerot, who wears the Mons Star among his many decorations, trained some of the original pilots of the R.F.C.

"France is behind-hand in modern technical air development, and we are working on a long-term policy," Gen. Ziegler told *Flight*. "The mission is mainly interested in military types and particularly in engines, but, like everyone else, we are also interested in the development of commercial aircraft and equipment, especially the larger types. During the next three weeks we hope to learn much and to lay the foundations for future close co-operation between our two industries."

The other eight members of the mission are Col. C. Rozenoff, Comdt. C. Teyssier and Comdt. A. Esperet (aircraft design, production, and fuel); Comdt. R. Marchal, M. R. Beauvais and M. J. de Lacharriere (engine design and production); and Capts. de Fregate E. Giboin and C. Penin (radio and signal design and production).

The Bomber's Record

Flexibility of Bomber Forces : Attacks on Factories Crippled German Fighters : Then Blows at Oil and Communications Paved the Way for Eisenhower

BEFORE he gave over command of the Mediterranean Fleet, Admiral of the Fleet Sir Andrew Cunningham expressed the opinion that the final blow in war is struck by the foot-slogging infantryman. Some time later Field Marshal Sir Bernard Montgomery said that it was our invariable plan to win the battle of the air before starting the battle on the ground. It is useful to keep those two *dicta* by great authorities in mind when considering the contribution which the bomber aircraft has made to the victory over Germany. We may also recall that *Flight* has always insisted that a bomber force must be flexible.

A statement on the work of heavy bombers has been issued jointly by the Air Ministry and by General Spaatz, who commands the U.S. Strategic Air Forces in Europe. In its opening paragraphs it lays stress on how the Allies gained air superiority before the invasion of Normandy, and on the flexibility which permitted the heavy bombers to turn at the shortest notice from strategic attacks on German production to tactical support of the ground troops, both by day and by night, with fighter escort and without it. The following are among the more important passages of the statement:—

The Allied strategic bomber forces began direct preparations for the Allied landing on the Continent at the beginning of 1944. By June 6, 1944, the Allies had already gained supremacy in the air, without which land operations could not be contemplated. The position by then was that Germany had no bomber force worth considering, either for strategic bombing or for use in land battles.

The attack on the single-engined fighter aircraft industry had deprived the German Air Force of more than 900 fighters between June and October, 1943. But the German Air Force was fighting fiercely to hold us off, and a quadrupling of production of their fighters was planned for 1944.

German Fighter Plants

This was accomplished in February, 1944, when a week of almost perfect bombing weather enabled the U.S. Air Forces to wreck several production complexes so completely that production of German fighters was reduced by 75 per cent. and the German High Command decided to disperse the industry into some 300 small factories and villages, many of the former underground.

An important effect which the strategic bombing of Germany produced was on the disposition of the German Air Force. To provide air defence against long-range bombing, the German Army was denied adequate air support.

Eighty railway targets in north-west Europe were listed for attack before D-Day by R.A.F. Bomber Command, the U.S. 8th Air Force and the A.E.A.F. For the heavy bombers the main task was the destruction of railway repair and maintenance facilities, and locomotives.

German counter-invasion plan was to bring their reserve divisions to the battlefield at the rate of forty-eight trains a day; this was cut by bombing to six trains a day. It is also known that some armoured divisions arrived at the battlefield without their armour, and that other troops arrived on bicycles or on foot.

It was not until early in 1945 that the enemy put their single-engined fighters into the field in support of the German Army. But by this time, the German air force was short of fuel as well as hopelessly outnumbered.

Synthetic Oil

In June of 1944, R.A.F. Bomber Command was accordingly required to take on the ten synthetic oil plants of the Ruhr, beginning with the four largest. Coincidentally, the U.S. Strategic Air Forces continued their attack on synthetic oil plants and refineries deep in Germany, the 8th Air Force attacking from England and the 15th from Italy.

It is probable that no single bombing campaign has been so complete in its effect as the attack on Germany's oil supplies. It was, of course, greatly assisted by the advance of the Russian Army, and in the later stages, by the advance from the West; the Rumanian, Polish, Hungarian, and central German sources of natural oil were overrun in turn. But without the bombing the German Army would have been able, with the products of the synthetic oil plants, to fight an efficient war of movement.

At all stages, from D-Day onwards, the German Army and Air Force were hampered by shortage of fuel, though during the Battle of Normandy the bombing of communications did more to impede the movement of the German Army than actual shortage of oil back in Germany. Meanwhile the first priority of all for the strategic bombers was the direct and tactical co-operation in the invasion, and this involved many innovations and new techniques. One of the main tasks of the heavy bombers was to neutralise ten super-heavy coastal batteries on the Normandy coast which were radar-sighted.

On June 30, 1944, the heavy bombers were first used on the actual battlefield of Normandy. Heavy bombers had previously reduced buildings which had become fortresses in the front line, and were to do so again, but here they were to bomb an area of open country or a village. The bombers could bring to bear a weight of attack equal to that of thousands of guns at a moment's notice and could thereby achieve surprise in a manner impossible to artillery.

Tactics for the use of the heavy bomber in a tactical rôle were rapidly developed. It was sometimes desired to hold the enemy on the flank of a projected advance, in which case the bombers churned up the whole countryside with deep craters and prevented any movement; at other times it was required to paralyse enemy troops, gun posts, and fortified positions in the direct line of a projected advance, and in such case bombs fused to produce no crater were used. It was learned that the effect of a bomb-barrage differed in many ways from the effect of artillery. The bombs seldom produced heavy casualties among the enemy; vulnerable vehicles were not likely to be so far forward, and the troops themselves were well protected in slit trenches. But the effect of the explosion of several thousands of tons of bombs in a small area within half an hour or so was to leave the enemy stunned and completely incapable of offering serious resistance.

During almost the whole of the Battle of Normandy the enemy was launching flying bombs against Southern England. The heavy bombers had delayed the V-weapon offensive by action taken many months before the first flying bomb was launched. The story of the bombing of Peenemunde is well known, but it may now be said that other targets for the heavy bombers were connected with the manufacture of V-weapons.

In the autumn of 1943, regular, persistent attacks began on permanent launching platforms for V-bombs in the Pas de Calais area of France, and these were continued by the strategic bombers, as well as U.S. 9th Air Force Marauders, up to the time in June, 1944, when the first flying bombs were launched against London. From that time on, the targets were mostly movable, prefabricated launching sites, but a great weight of attack was continued against them.

Battle for Antwerp

In the battle for the use of the port of Antwerp, an essential preliminary to the Battle of Germany, it was the task of the heavy bombers to destroy the main enemy defence on the island of Walcheren which guarded the mouth of the Scheldt. Bombing breached the dykes and flooded the greater part of the island, so that the enemy had to leave his strong points on flat ground and take to the dykes, where gun positions could be tackled by the Navy or, in some instances, attacked by the heavy bombers.

The attack on oil, the attack on German comunications, the bombing of industrial areas, had a single and immediate aim, the disintegration in the near future of all the German armed forces. When the Russians invaded Germany it was the task of the Allied strategic bombing forces to prevent the reorganisation of the German Army and of the political control of Central Germany by bombing military targets in Berlin and the main industrial centres of Saxony. Perhaps the most important of all the bomber operations in the closing stage of the Battle of Germany was the part they played in the isolation of the Ruhr.

German jet-propelled aircraft began to appear in small numbers in the late summer and early autumn of 1944. This type never appeared in large numbers, largely because the factories for components and assembly were bombed.

The final death blow to the German Air Force took place in late March and early April. German airfields were cratered, and lack of petrol prevented machines from taking refuge far back. In eight days in April almost 2,000 aircraft were destroyed on the ground.

HERE AND THERE

Civic Honour

AIR CHIEF MARSHAL SIR ARTHUR HARRIS, Bomber Command's chief, who was educated at All Hallows School, Honiton, is the receive the Freedom of the Borough of Honiton.

Dunlop Chief Resigns

MR. C. A. PROCTOR, joint managing director of the Dunlop Rubber Co., Ltd., has resigned on completion of 54 years' service with the company at home and abroad.

Honourable Director

LT. GEN. KUMAICHI TERAMOTO, a former assistant military attaché in Washington, has been appointed director of Japanese army aviation headquarters. He succeeds Gen. Korechika Anami, War Minister in the new Suzuki Cabinet.

U.S. Air Chief's Award

THE Distinguished Service Medal for "exceptionally meritorious service" has been awarded by Gen. H. H. Arnold to Brig. Gen. Benjamin W. Chidlaw, commander of the Mediterranean Allied Tactical Air Forces and 12th Allied Air Forces.

A.T.C. Week-end

THREE interesting events for the coming week-end have been planned by the A.T.C. under the auspices of the Chief Commandant and Director General, Air Marshal Sir Leslie Gossage, K.C.B., C.V.O., D.S.O., M.C.

On Saturday, May 12th, the A.T.C. International Football Match (England *v.* Scotland) will take place at Tottenham Hotspur Football Club Ground, White Hart Lane, N.17—kick-off 3.30 p.m.

On Sunday, May 13th, the National Air Training Corps will parade in Hyde Park (The Cockpit) at 3.0 p.m., and the Salute will be taken by Marshal of the Royal Air Force, Sir Charles Portal, G.C.B., D.S.O., M.C., Chief of the Air Staff, and on Monday, May 14th, at 7.0 p.m., the A.T.C. National Boxing Championships will be held at the Royal Albert Hall.

AIR TO GROUND: The potentialities of the rocket projectile having been developed and proved with aircraft, this weapon has now been adapted for tanks—in this case, the Sherman. They are electrically fired from inside.

Buoy, Oh Buoy!

"THE well-known Sunderland," says an article on flying boats in the May issue of *The Sea Cadet*, ". . . is also used for civil flying and is a lighter boat than the Stirling."

Short Brothers will not mind our adding that it also floats much better.

King to Visit Cranwell

THE King is to visit the R.A.F. College, Cranwell, on Wednesday next, May 16th, when the College's Silver Jubilee is to be celebrated. His Majesty was himself at Cranwell as a young officer during the last war.

Incidentally, this is the first advance announcement of a Royal movement to be made since the security ban was imposed at the start of the war.

Air Marshal Knighted

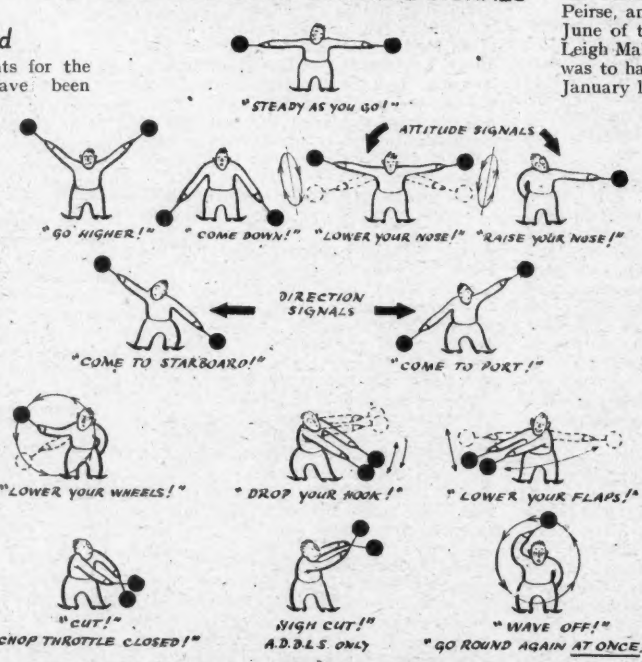
THE KING received in audience Air Marshal Sir Guy Garrod, "Seac's" Allied Air C.-in-C., at Buckingham Palace last week.

Sir Guy, whom the King knighted and invested with the Insignia of the K.C.B., went to India in 1943 as deputy to Air Chief Marshal Sir Richard E. C. Peirse, and his award was gazetted in June of the same year. Sir Trafford Leigh Mallory, it will be remembered, was to have succeeded Sir Richard in January last, but his aircraft was lost when he was on his way, with Lady Leigh Mallory, to take up the post and Sir Guy was appointed in his place.

U.S. Naval Air Strength

THE U.S. Navy now has seven times the number of aircraft it had on its strength at the time of the attack on Pearl Harbour, and has imposed an aircraft loss ratio of five to one on the enemy.

This was reported by Admiral D. C. Ramsey, chief of the Bureau of Aeronautics, to the House Committee on Appropriations, and he also said that since the autumn of 1942, when the U.S. had only three aircraft-carriers left in the Pacific Ocean, the Navy had built up a fleet of nearly 100 carriers whose aircraft



THE BATSMAN: Deck landing control officer's signals to pilots. A.D.D.L.S. means "aerodrome dummy deck landings."

HERE AND THERE

had been the spearheads of the naval offensive.

He also mentioned that during the past four years the top speed of fleet fighters had gone up by approximately 100 m.p.h., ranges had nearly doubled, and armament had more than tripled its effectiveness.

Gas Turbine Future

AIR COMDRE. FRANK WHITTLE, speaking to A.T.C. squadrons at Leicester last week, told them that the gas turbine would, within ten or fifteen years, replace the reciprocating piston engine in aircraft, except for light types. He did not think there would be a successful design of gas-turbine engine of under 500 h.p., so they were not likely to see this form of power-unit in motor cars.

Working Overtime

THE fifty air-liners operated by United Air Lines are now putting in an average flying time of 13hr. 20min. a day in comparison with the 8hr. 45min. a day flown before the war, it was recently reported by the company.

Collectively they are covering 100,000 miles daily on U.S. air routes.

Cheaper U.S. Insurance

A NUMBER of leading insurance companies in America have recently reduced their rates for aviation insurance, and some new groups have entered this field of business. The downward trend in the cost of aviation insurance was started last November when Connecticut General Life Insurance Co. made attractive cuts in their rates.

Parachute Pet

TO mitigate the loneliness of a small unit of the U.S. Signal Corps at an isolated output in the wilds of Burma, the crew of a C-47 recently dropped them a dog by parachute, using improvised harness and a small 'chute of the type used for dropping food containers. The dog landed safely and the grateful recipients radioed their thanks to base.

Attrition

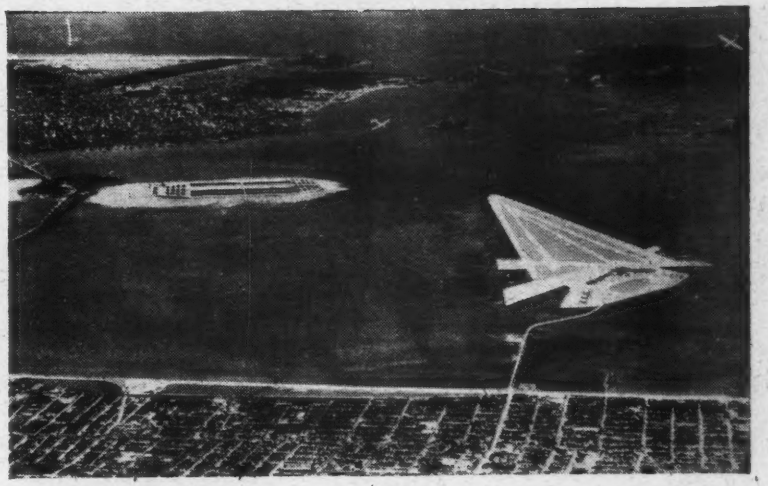
SINCE the Japanese entered the war, their Naval Air Corps has lost approximately 25,000 men. The present strength is some 200,000, which is about one quarter of the Jap Navy's total establishment and includes non-flying personnel.

Additionally there is their Naval Aviation Reserve composed of selected students from universities, colleges and high-schools. These learn to fly during their summer vacations, and after graduation are ordered to the Kasumiguara naval air station for advanced training.

Tailless Contest

A CONTEST for tailless models, to be held by the Society of Model Aeronautical Engineers, is being sponsored by Sir Frederick Handley Page. It will be open to gliders and power-driven models using any kind of motive power, and cash prizes totalling £100 are to be won.

The first six in each of the eliminating contests in five areas will be eligible to compete in a final contest which it is hoped to hold in September. Closing date for entries in the area contests is August 5. Rules and other information can be obtained from Mr. F. E. Wilson, 34, Babington Road, Hendon, London, N.W.4.



KAISERDROME : This plan for a Pacific air terminal in San Francisco Bay has been put forward by the Henry J. Kaiser Co. Estimate says that 44,000,000 cu. yd. of fill would be needed to make the 1,100-acre island airport with its four 5,700ft. runways, at a cost of $14,000,000.

Coals from Newcastle

AMERICA has for so long been the almost traditional home of "gas" that it comes as a surprise to learn that she is now actually importing benzole from Australia for the production of aviation spirit.

The benzole is a by-product of the coke ovens at Newcastle and at the Port Kembla steel works, and when Australian needs have been met 12,000 tons are to be sent to the U.S. this year—enough to produce some 18,000 gallons of aviation fuel.

Tapering Off

A 15 per cent. cut in overall aircraft production in the U.S. has been announced as probable by the U.S.A.A.F. at Washington. But it will not be a sudden cut; it will taper off over a period of several months.

The reduction in output will not apply to the super-bombers and heavy transports, nor to jet fighters and one or two other types, some of which will actually be stepped up still more in production rate. The idea, in fact, is to permit a more intensified concentration on the types necessary to defeat Japan as soon as possible.

Changing Over

PRODUCTION of Liberator bombers at the Ford plant at Willow Run will cease before August, according to a recent statement in Detroit quoted by Reuter. Studies are being made to see if the plant can be adapted for the production of other types of aircraft.

Production of Flying Fortresses at the Lockheed and Douglas factories in California has also been halved, but that of the Lockheed P-80—the jet-propelled fighter, Shooting Star—is to be accelerated.

The reason for these changes is said to be the report from Europe that "the *Luftwaffe* has been whipped."

R.Ae.S. at Glasgow

THE recently formed Glasgow branch of the R.Ae.S. is holding a debate in the Royal Technical College, Glasgow, on Wednesday, May 16th, at 7.30 p.m., entitled "Flying Within the Reach of the Man-in-the-Street."

The debate will be opened by the branch president, Major F. A. Bumpus, B.Sc., F.R.Ae.S., managing director of Blackburn Aircraft, Dumbarton, and Grp. Capt. D. F. McIntyre, A.F.C., managing director of Prestwick Airport.

A.S.P. Lectures

AFTER the annual general meeting of the Association for Scientific Photography on Thursday, May 24th, Mr. S. R. Thorne, A.R.P.S., will give a lecture on "Photography Applied to Research in the Steel Industry." The meeting will be at Caxton Hall, Westminster, at 7 p.m., and the lecture is timed for 7.30 p.m.

Then on Saturday, June 30th, a 2.30 p.m. meeting at the same hall will be addressed by Mr. Harold White, F.I.B.P., F.R.P.S., on "Make the Photograph Tell a Story."

Fame !

THE following ancedote is vouched for as true by Col. J. C. Fitzmaurice.

The scene is the bar of a famous West End centre of aeronautical interest; the characters (a) Rotol Test Pilot, gloomily sipping his half-can and wondering who all the other people are, and (b) one of these complete Strangers.

The Stranger approaches Rotol Test Pilot and says: "Have we not met somewhere before?"

"Yes, I'm sure we have, somewhere or other," replied the R.T.P. out of sheer politeness.

"What are you doing now?" asked the Stranger by way of stimulating conversation.

"Oh, I'm still with Rotol."

"Rotol? Rotol? who on earth are they?" said the Stranger. "Oh, I know! Aren't they the people who make a special type of mouth-wash?"

D

HEINKEL He177

A General Survey of One of the Enemy's Large Four-engined Heavy Bombers

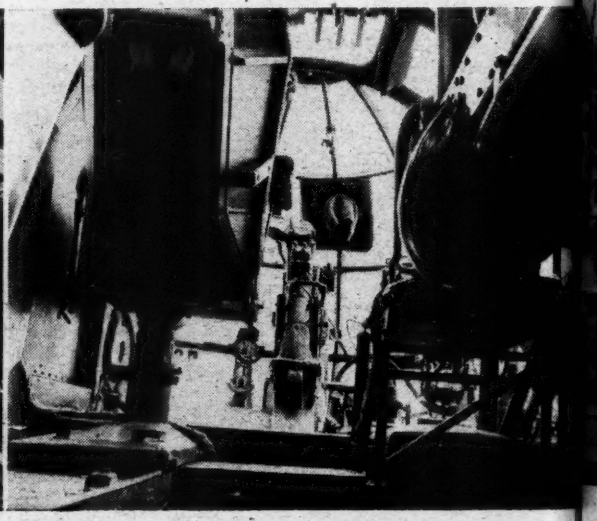
(Illustrated with "Flight" Photographs)

WE have recently had the opportunity to make a brief inspection of a Heinkel 177, the only one that exists intact in this country. This particular machine must have had a somewhat chequered career, for the phrase "Prise de Guerre" is painted on each side of the fuselage and confirms the annotation in French of various primary instruments and controls. Apparently the aircraft was captured by the French and later flown to this country; here, Farnborough combed it thoroughly and, we understand, it is now to be shipped to America.

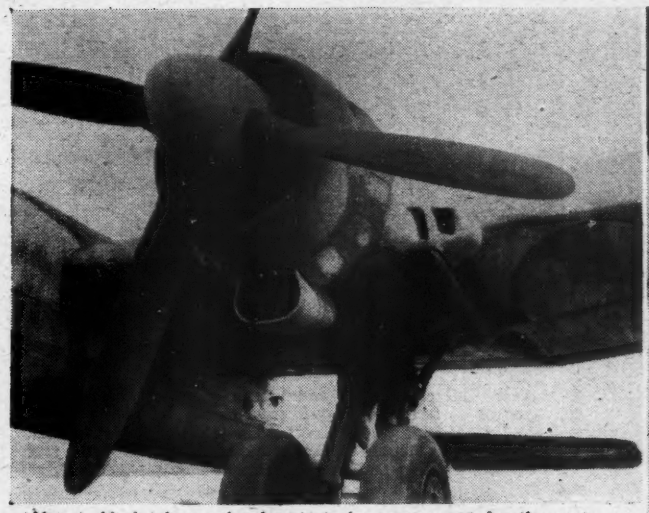
The He 177 is a large aircraft; its wing span is 103ft. and its length 72ft., nevertheless it is not an impressive machine and at no time did we feel that its appearance of ugliness was compensated by operational qualities. Beside the trim "Englishness" of Lancaster and Halifax the He 177 seems a not very worthy opponent—on any count—and this, as far as we could judge from a quick look round, appears to be a fair conclusion.

As with the majority of German aircraft, the 177 embodies various features which point to a marked ingenuity in design; yet one never really feels that this ingenuity is fully worth while; it smacks of a kind of precocity which one can tolerate, and, to a certain extent admire, yet remain unconvinced of its merit. One such feature, probably the chief, is the employment of four modified D.B.605 liquid-cooled inverted V12 engines mounted side by side in pairs (and thus designated D.B.610). Each pair of engines are geared together and

Control column and pilots' flight instruments. The two small levers beneath the column elbow are the airscrew controls.



Looking forward along pilots' floor, the right rudder pedal, control column and forward gun shroud are visible.



(Above) Air intakes and exhaust stack arrangement for the port pair of engines. Blade cuffs, cooling gills and undercarriage well fairing doors can also be seen. (Right) The massive and elaborate undercarriage structure showing the levered form of wheel mounting.

jointly power a single electric c.s. airscrew, hydraulic clutches being interposed to enable either engine to be uncoupled if necessary. Airscrews are 14ft. 9½in. diam., and are handed, the port being left-hand and the starboard right-hand tractor.

Radial Influence

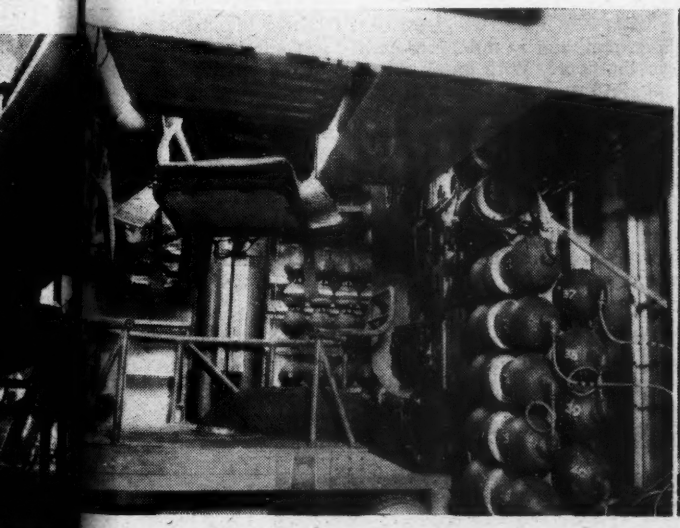
As the mid-wing is a single-spar type the engines can be housed well back along the chord, the nacelles, as such, being cylindrical in the radial engine manner. The nose of the nacelle, however, is occupied by circular radiators and the airscrew blades carry root cuffs to enhance cooling airflow. An impression of a radial engine installation is emphasised by the employment of gills to control the cooling airflow.

The undercarriage is another example of misplaced ingenuity, although one can evolve all sorts of reasons for having such a design. Beneath each nacelle are two wheels mounted on massive forged legs which employ a form of levered suspension for the wheel, using grease as the damping medium. Retraction and extension of the legs is hydraulic, the inner legs swinging upward and inward, and the outer members upward and outward.

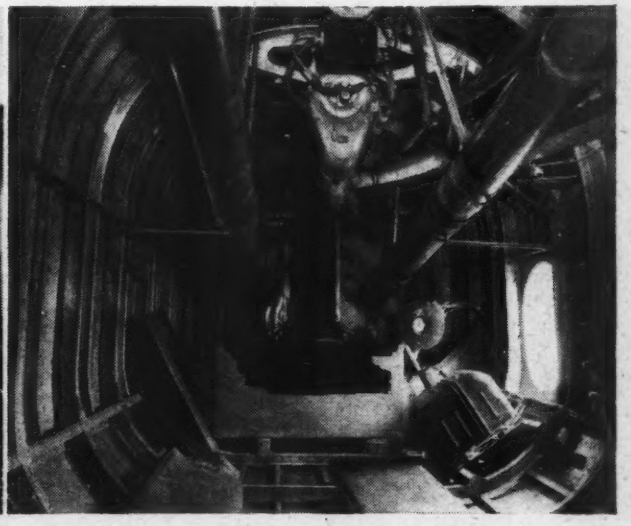
Wing structure is of the conventional stressed-skin type built up on a single spar. Fowler-type flaps are employed, and the ailerons, which, in common with the rudder and elevators are metal, are aerodynamically and mass balanced as well as being fitted with trim and balance tabs. De-icing to wing and tailplane leading edges is by hot air supplied, via ducts, from fuel-burning heaters.

Accommodation in the fuselage is segregated, four of the crew being housed in the main nose cabin, one in the centre fuselage—the rear-dorsal gunner, and one at the tail gun. No physical communication is possible between the compartments. The tail gunner is protected from behind and below by armour plate and bullet-proof glass, but not from the side and above; additionally, his gimbal-mounted hand-operated 20 mm. gun has a very restricted field of fire.

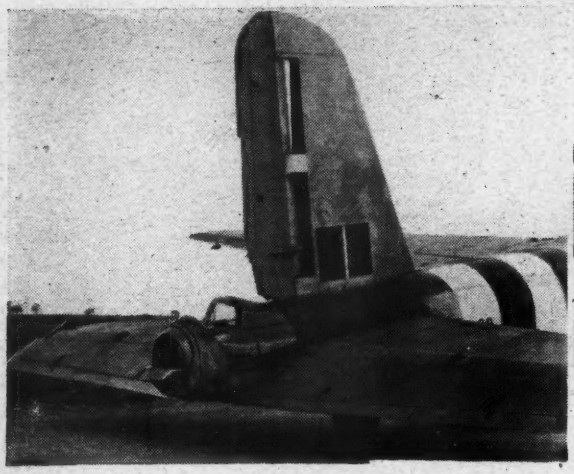
Fuselage structure is in four panels—roof, floor and the

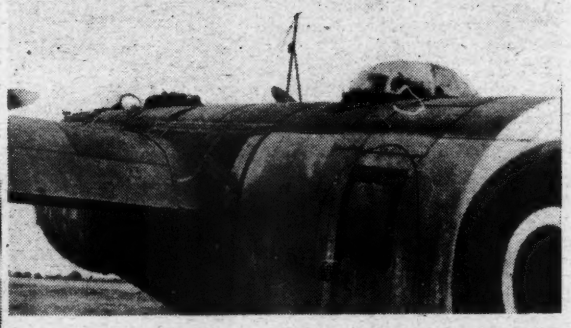


Platform and swing seat for rear dorsal gunner. The sperical bottles are for oxygen supply.



Fuselage tail interior showing trailing aerial winch, etc., (bottom right) and de-icing hot-air ducts and blower in roof.



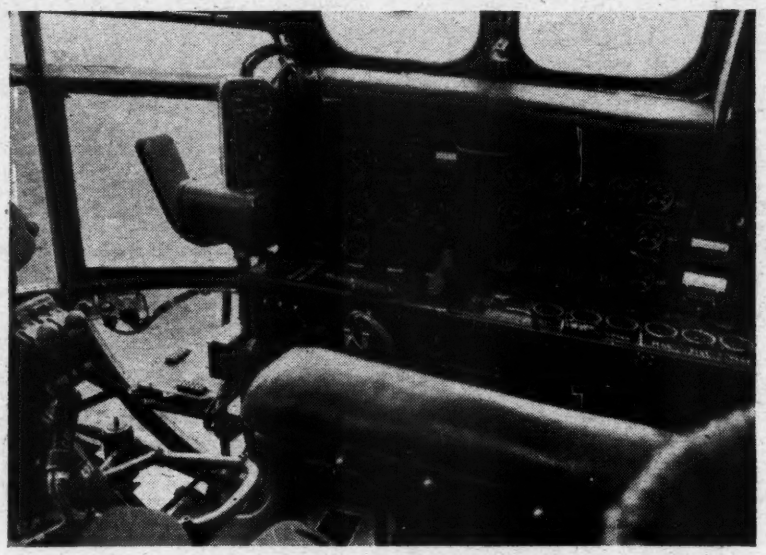


(Left) Tail end. Trim and balance tabs are fitted to all control surfaces. Tail gun emplacement is of very poor design. (Right) Above the "Prise de Guerre" is the rear dorsal turret whilst the front dorsal remote barbette and its sighting station are above the centre-section.

HEINKEL He177

slab sides. The latter are stressed skin on major and secondary frames without stringers, the frames being of lipped angle section of heavy and light gauge. Top, or roof, panels are skinned on lipped angle frames notched for passage of the Z-section extruded stringers, and are attached to the side panels through rolled lipped-angle longerons. Bottom panels are similar in construction to the roof panels, but are attached to the side panels at the heavy extruded Z-section lower longerons.

At the front end of the middle fuselage compartment the rear-dorsal gunner sits in a swing seat suspended from his gun mounting ring. This gun, a 13 mm., is electrically rotated but hand elevated, and is fed from large capacity ammunition boxes on the port side, expended shell cases being evacuated through a flexible duct leading to a hole in the floor.



Engine, ancillary service and flying instruments for the second pilot are mounted along the starboard wall.

As stated, four of the crew occupy the main nose cabin of the aircraft and, by the size of it, they must be fairly cramped. To British eyes the control layout is "bitty," and no R.A.F.-trained pilot would feel happy with it.

A 20 mm. gun gimbal is mounted through the front of the nose glazing, and the bomb sight is carried beneath it in the floor. In the roof behind the pilots sits the front dorsal gunner, this position being a sighting station for the two 13 mm. guns carried in a barbette further aft and remotely controlled electrically. On the rear bulkhead the radio sets are mounted, and the operator also fires the single 20 mm. and 13 mm. guns carried in ventral mountings in the floor. With an aspect ratio of 9.9 for a wing area of 1,076 sq. ft., the Heinkel 177 has a wing loading of 63.6 lb./sq. ft. at an all-up weight of 68,500 lb. Empty weight is 37,000 lb. Ratings for emergency and take-off are 3,100 b.h.p. for 2,800 r.p.m. and +5.5 lb. boost at 6,900ft. Maximum continuous power is 2,260 b.h.p. at 2,300 r.p.m. and +1.7 lb. boost at 6,900ft., and economical cruising 1,780 b.h.p. at 2,100 r.p.m. and −0.41 lb. boost at 18,700ft. For take-off at 68,500 lb. the aircraft unsticks at 115 m.p.h. within the very reasonable distance of 1,140 yards, and climbs at 171 m.p.h.

Swiss Planning

Expansion of Landing Facilities : Central International Airport

By E. A. BELL

SWITZERLAND'S role within the post-war framework of international air transport is attracting considerable attention in the Swiss Press. Closely followed are also international preparations for the resumption of air services in Europe and elsewhere and local and regional bodies display keen interest in the development of ground facilities for the transit of traffic through Switzerland.

To some extent this has been marked by a regional competition as to the location of the future central airport, but the general tendency is to disregard regional susceptibilities in favour of one main base. This would offer all the facilities required for an all-weather operation of service schedules. Thus a scheme approved February last by the Federal Council and which is to be submitted to the Federal Assembly for final approval, envisages for the post-war organisation of Swiss air transport four main urban airports at Basle, Geneva, Zurich and Berne.

3,000-Metre Runways

The Zurich airport, however, is to be elevated to the rank of Switzerland's international or central aerodrome. According to a proposal originating with the Zurich Cantonal Government, this is to be located at Kloten, 6.8 miles (11 km.) north of Zurich, on the relief railway line branching off at Oerlikon from the Zurich-Winterthur main railway line and joining the latter again to the west of Effretikon, 5.6 miles (9 km.) to the south of Winterthur. Kloten would replace Dübendorf, the present civil airport of Zurich, and the scheme envisages facilities enabling the airport to deal with machines of up to 40 tons and with the intercontinental airliners of up to 80 tons. The first runway for blind flying to be completed is to be 9,840ft. long (3,000 metres) and 1,312ft. (400 metres) wide, in addition to a 328ft. (100 metres) wide lateral protection zone on each side. The concrete starting runway to be comprised in the above is to be 5,576ft. (1,700 metres) long. Runways assigned to the Swiss inter-urban traffic are to vary in length between 4,592ft. and 3,280ft. (1,400 and 1,000 metres respectively).

The rival scheme concerning the development of the present Dübendorf aerodrome has been dropped, allegedly because of technical difficulties and the special requirements of the adjoining military airfield.

In addition to the above-mentioned aerodromes, the scheme envisages five minor "regional airports," i.e., Lausanne-Ecublens, La Chaux-de-Fonds-Les Eplatures, Locarno-Magadino, St. Gallen-Altenrhein and Samedan (the former Samaden in the Grisons). All these existed already before the war but are to be modernised.

The Lausanne municipality provided already for an extension of 205 acres to the present airport at Ecublens, and the cost of bringing it up to date is envisaged to amount to 6,000,000 francs, of which 4,000,000 is to be contributed by the Federal Government. Work is to be taken in hand as soon as circumstances permit. The Blécherette aerodrome near Lausanne will be disposed of owing to the impossibility of developing it.

The Geneva municipality has shown more initiative and extensions and modernisation of its airport at Cointrin have already been completed. When the Cointrin airport was first established in 1920 it covered an area of 133½ acres (54 hectares); in 1942 it was 235 acres (95 hectares). Its first concrete runway, dating from 1936-1937, was 1,328¼ft. long (405 metres) and 69ft. wide (21 metres). Despite the war it has been widened to 164ft. (50 metres) and its length extended first to 3,280ft. (1,000 metres) and subsequently to 3,936ft. (1,200 metres) and provision has been made for its ultimate extension to 8,200ft. (2,500 metres). Of all the Swiss main civil aerodromes the one at Cointrin was found to be most easily extended due to the favourable topographical conditions of the region to the south-west of Geneva, where it is located. A further advantage is that it lies in the path of but one main wind direction, obviating thus the necessity of the usual triangular runway arrangement.

Basle seems to be in a less fortunate position. The present airfield at Sternenfeld, near Birsfelden, is too small and its area has been, in addition, encroached upon by the Rhine port development. Of the various schemes which had been evolved before the war, the scheme for an airport at Allschwil-Burgfelden seemed to have found most favour. This airport would be located to the west of Basle, but its drawback is that according to the plan it would be crossed by the Franco-Swiss border. How this difficulty would have to be solved is unknown so far; the originators of the scheme maintain that the airfield, situated partly in France and partly in Switzerland, would prove an advantage to both countries in addition to its value as an international airport.

New Berne Airport

The present Berne airport, located near Belpmoos, to the south of Berne, has been found already before the war to be incapable of dealing with intensified air traffic, and the scheme envisages a modern aerodrome near Utzenstorf, to the north-west of Berne, on the Burgdorf-Soleure railway line branching off at Burgdorf from the Zurich-Berne main railway line. The distance from Berne would be 21 miles by rail and 13.6 miles by road. There was once talk that Utzenstorf should become Switzerland's central airport, but preference seems to have been given to Kloten. The original Utzenstorf scheme met also with a certain amount of opposition from farming interests in the area. The area which would be required for an inter-urban aerodrome would, of course, be less extensive than that for an international airport.

Other minor projects concern airports near Bellinzona, Lugano and Mendrisio, intended as local landing places subsidiary to the projected Locarno-Magadino airport; furthermore, an airport near Davos, subsidiary to the already mentioned Samedan airport, as well as airports near Neuchâtel and Lucerne.

AIR TRANSPORT OPERATORS

THE executive committee elected at the Havana Conference of the International Air Transport Association is composed of the following members: Rene Briand, France; A. F. T. Cambridge, Indian National Airways; John C. Cooper, Vice-President, Pan American Airways; Dr. J. B. Ribeiro Dantas, Brazil; Hudson Fysh, Qantas; Major J. R. McCrindle, B.O.A.C.; Per A. Norlin, President, Swedish Inter-Continental Airlines; Albert Plesman, Managing Director, K.L.M.; and John E. Slater, American Export Airlines.

As previously reported, Mr. Herbert J. Symington, President of Trans-Canada Airlines, was elected President. The post of President is an ordinary position, with management of the Association vested in the executive committee. One of the first actions of the executive committee was to authorise the organisation of an International Air Traffic Committee to handle rates, ticketing, etc.

AIR MAIL TO AUSTRALIA

MR. A. S. DRAKEFORD, Australian Air Minister and Minister for Civil Aviation, announced in Canberra that the England-Australia air mail service with new Lancastrian aircraft is expected to begin in the next two months. He explained that the delay had been caused by Britain's heavy war commitments in aircraft production.

Cargo Aircraft

Part II of a Study of the Efficiencies of Various Designs : A Modified "Figure of Merit"

By ROBERT J. NEBESAR

(*Continued from page* 480)

FROM the above data* the thrust horse-power required for different speeds are calculated, and the results are plotted in Fig. 3, showing in full lines the thrust horse-power required curves for normal gross weights and in dotted lines those for 20 per cent. overload weights. The thrust horse-power available is determined for each set of engines for their pertaining 60 per cent. of M.E.T.O. horse-powers, and it is assumed that 84 per cent. airscrew efficiency will be obtained for each aircraft at its cruising speed.

The resulting sea-level cruising speeds are shown in Fig. 3 for both gross and overload weights, and listed in Table II in lines 6 and 22 respectively. The altitude cruising speeds are assumed to increase 10 per cent. above the sea-level speeds, and are given in line 7 for normal gross weight and in line 23 for overload weights.

From Fig. 3 two major trends should be noted:—

1. There are substantial increases in speeds accomplished in all three different engine sizes with aircraft of higher wing loadings. The rate of speed increase is, however, slowed down as high wing loadings are approached. Here we want to state that actually this would be still more pronounced because the basic assumptions are conservative as far as aircraft of low wing loadings are concerned, due to interference effects, which are not taken into consideration. The aircraft of low wing loadings have much bigger wings; therefore interferences of nacelles, tail booms, and fuselages will be less pronounced than with aircraft of smaller wings.

2. The rate at which speed increases from the lower engine size group to the higher one is much faster for high wing loadings. This is also due to such conservative assumptions as stated above for aircraft of low wing loadings.

* See last week's issue—Ed.

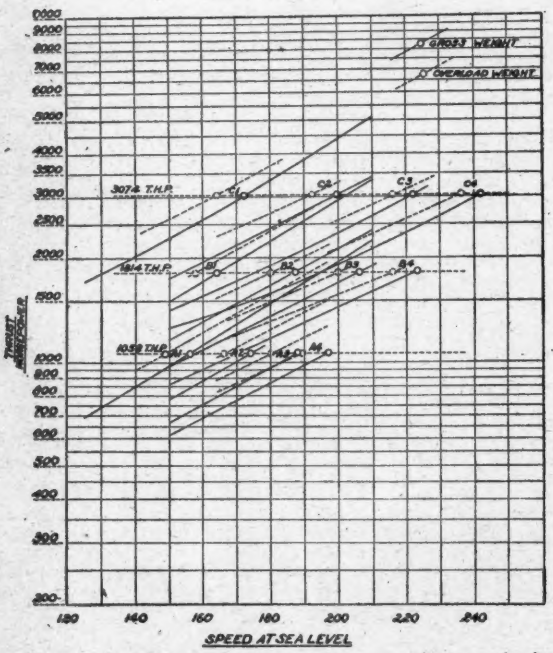


Fig. 3. Cruising speeds at normal gross and at overload weights.

However, the greater loads carried by aircraft of lower wing loadings will greatly outbalance the effect of speeds.

In Table II the following weights are accounted for: The useful loads are given in line 2. Crew weights are given in line 3, assuming a crew of three for "A" aircraft, and a crew of five for aircraft "B" and "C."

Cargo fuel increments weights, these including the weights of petrol tanks as already explained, are given in line 4 for standard gross weight, and in line 21 for 20 per cent. overload condition. The petrol consumption is figured as 0.44 lb./h.p. hour, oil consumption 0.022 lb./h.p. hour, and the petrol tanks weight increment is assumed 0.037 lb./h.p. hour. This is figured on the assumption that the weight of the petrol tanks is approximately 0.5 lb. per gallon. The total weight of fuel increments per horse-power hour is therefore 0.499 lb., that is, approximately 0.5 lb./h.p. hour as used in the calculations.

The weight of fuel increments per hour for different engine sizes is given in line 9. The necessary fuel reserve is not taken into consideration because this can be converted into a greater range requirement. It simply means that a comparison can be made for ranges 25 or 30 per cent. greater. This will, therefore, not affect the relative load-carrying capacity or efficiency.

Based on cruising speeds, as in line 7 for gross weight and in line 23 for overload condition, the maximum range is given in lines 10 and 25 respectively. The small speed-increases caused by decreasing weights as petrol is consumed have not been taken into account.

For standard gross weights, the ranges and pertaining cargo loads are figured for distances of 500, 1,000, 1,500, 2,000, and 3,000 miles, this last distance being possible to be flown by the aircraft of low wing loadings only as shown in line 20. Of course, greater distances could be obtained by flying at lower speeds with lower cruising horse-power, but the differences of cargo loads possible to be carried with aircraft of high wing loadings and low wing loadings would not be substantially changed.

Overload Conditions

For overload conditions, the range and pertaining cargo loads are figured for distances of 1,000, 2,000, and 3,000 miles. It should be noted that the cargo loads at 3,000-mile distances as given in line 31 are substantially smaller for aircraft of high wing loadings as compared with those of lower wing loadings.

For 20 per cent. overload conditions, as investigated for ranges above 2,000 miles, the increased weight due to overload equals approximately that of fuel increments, this indicating the necessity and possibility of allowing high percentage increase for alternate overload conditions.

All the above cargo loads and ranges are shown graphically in the Cargo Load-Range Diagram, Fig. 4, for both gross weight and overload conditions. The trend of superior cargo load-range performance of aircraft with lower wing loadings is clearly indicated. While cargo loads increase steadily with both increasing engine size and decreasing wing loadings, the range increases only with the decreasing wing loadings staying approximately the same

for any engine size. This is, however, a characteristic pertaining to cargo aircraft of this particular design, and cannot be generalised for any aircraft of much bigger size with more than two engines, where loads would be carried inside the wings; and where still better structural and aerodynamic efficiency could be accomplished.

Increased Wing Loading

The effect of increasing wing loadings for three given engines sizes for cargo loads at ranges of 500, 1,000, and 1,500 miles for normal gross weight, and 1,000, 2,000, and 3,000 miles for overload conditions, is shown in Fig. 5. The effect of increasing engine sizes at four different wing loadings on cargo loads at ranges of 500, 1,000, and 1,500 miles for normal gross weight, and 1,000, 2,000, and 3,000 miles for overload conditions, is shown in Fig. 6.

From Fig. 6, Overload Condition, the important effect of wing loading can be visualised. The aircraft of 33 lb./sq. ft. wing loading would carry for 1,000 miles' distance approximately the same load as the aircraft of 26 lb./sq. ft. wing loading would carry for 3,000 miles' distance, and as the aircraft of 20 lb./sq. ft. wing loading would carry for 3,000 miles' distance, disregarding the size of engines used. Also the aircraft of 40 lb./sq. ft. wing loading would have approximately the same pay load for a range of 1,000 miles only, while the one of 33 lb./sq. ft. wing loading would range 2,000 miles and the one of 26 lb./sq. ft. wing loading would range 3,000 miles for the same engines used. The aircraft of 20 lb./sq. ft. wing loading would range approximately 4,000 miles, or would carry approximately 50 per cent. more load for 3,000 miles' range.

Two formulæ of distinctly high merit were suggested in the past for determination of cargo aircraft efficiencies.

(1) Efficiency factor $= \dfrac{\text{Cargo Load} \times \text{Cruising Speed}}{\text{Cruising Horse-power}}$

as proposed by Charles Froesch, Chief Engineer of Eastern Air Lines;

(2) Cargo utility factor $=$

$$\frac{\text{Range}}{\dfrac{\text{Cargo Load}}{\text{Weight Empty}} \times \dfrac{\text{Flying Time}}{\text{Landing Speed}} + \text{Handling Time}}$$

as proposed by Carlos Wood, of Douglas Aircraft.

While formula (1) does not take into consideration the

TABLE II.—AIRPLANE CARGO LOADS AT DIFFERENT RANGES

		2x 1,050 Meto H.P. Engines, 2,400 T.O. H.P.				2x 1,800 Meto H.P. Engines, 4,200 T.O. H.P.				2x 3,050 Meto H.P. Engines, 7,000 T.O. H.P.			
1	Airplane designation*	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
2	Useful loads as stated, lb.	15,830	12,220	8,905	6,522	24,255	18,600	13,975	10,270	35,500	28,195	20,720	15,305
3	Crew, lb.	510	510	510	510	850	850	850	850	850	850	850	850
4	Cargo + fuel increments weight, lb.	15,320	11,710	8,395	6,012	23,405	17,750	13,125	9,420	34,650	27,345	19,870	14,455
5	60 per cent. METO H.P.	1,260	1,260	1,260	1,260	2,160	2,160	2,160	2,160	3,660	3,660	3,660	3,660
6	Cruising speed at S.L. (60 per cent. METO H.P.), m.p.h.	156	174	188	197	164	187	206	223	172	199	222	243
7	Cruising speed at 10,000ft (approx. 10 per cent. increase above figure in line 6)	172	191	207	217	181	206	227	245	190	219	244	268
8	Landing speed (10 m.p.h. above stalling speed), m.p.h.	69	77	85	93	69	77	85	93	69	77	85	93
9	Fuel increments weight per hour, lb.	630	630	630	630	1,080	1,080	1,080	1,080	1,830	1,830	1,830	1,830
10	Maximum range (no load), miles	4,170	3,550	2,750	2,060	3,920	3,390	2,760	2,130	3,570	3,280	2,650	2,120
11	Fuel increments weight at 500 miles, lb.	1,835	1,650	1,525	1,455	2,985	2,620	2,380	2,205	4,815	4,170	3,750	3,410
12	Cargo load at 500 miles, lb.	13,485	10,060	6,870	4,557	20,420	15,130	10,745	7,215	29,835	23,164	16,120	11,045
13	Fuel increments weight for 1,000 miles, lb.	3,670	3,300	3,050	2,910	5,970	5,240	4,760	4,410	9,630	8,340	7,500	6,820
14	Cargo load at 1,000 miles, lb.	11,650	8,410	5,345	3,102	17,435	12,510	8,365	5,010	25,020	19,005	12,370	7,635
15	Fuel increments weight for 1,500 miles, lb.	5,505	4,950	4,574	4,365	8,955	7,860	7,140	6,615	14,445	12,510	11,250	10,230
16	Cargo load at 1,500 miles, lb.	9,815	6,760	3,820	1,047	14,450	9,890	5,985	2,805	20,205	14,835	8,620	4,215
17	Fuel increments weight for 2,000 miles, lb.	7,340	6,600	6,100	5,820	11,940	10,480	9,520	8,820	19,260	16,680	15,000	13,640
18	Cargo load at 2,000 miles, lb.	7,980	5,110	2,295	192	11,465	7,270	3,605	600	15,390	10,665	4,870	815
19	Fuel increments weight for 3,000 miles, lb.	11,010	9,900	—	—	17,910	15,720	—	—	28,890	25,020	—	—
20	Cargo load at 3,000 miles, lb.	4,310	1,810	—	—	5,495	2,030	—	—	5,760	2,325	—	—
	Overload Conditions												
21	Cargo + fuel increments weight, lb.	22,520	17,230	12,705	9,612	36,005	27,410	20,765	15,720	55,650	43,445	32,610	24,955
22	Cruising speed at S.L. (60 per cent. METO h.p.), m.p.h.	148.5	166	180	188.5	157.5	180	200	216.5	164	192	216	237
23	Cruising speed at 10,000ft., m.p.h.	164	183	198	208	174	198	220	239	181	212	238	261
24	Landing speed (approx. 9½ per cent. above figure in line 8), m.p.h.	76	84	93	102	76	84	93	102	76	84	93	102
25	Maximum range (no load), miles	5,870	5,015	4,000	3,170	5,800	5,020	4,230	3,480	5,500	5,020	4,230	3,560
26	Fuel increments weight for 1,000 miles, lb.	3,840	3,440	3,180	3,030	6,210	5,460	4,910	4,520	10,120	8,640	7,700	7,010
27	Cargo load at 1,000 miles, lb.	18,680	13,790	9,525	6,582	29,795	21,950	15,855	11,200	45,530	34,805	24,910	17,945
28	Fuel increments weight for 2,000 miles, lb.**	7,680	6,880	6,360	6,060	12,420	10,920	9,820	9,040	20,240	17,280	15,400	14,020
29	Cargo load at 2,000 miles, lb.	14,840	10,350	6,445	3,552	23,585	16,490	10,945	6,680	35,410	26,165	17,210	10,935
30	Fuel increments weight for 3,000 miles, lb.**	11,520	10,320	9,540	9,090	18,630	16,380	14,730	13,560	30,360	25,920	23,100	21,030
31	Cargo load at 3,000 miles, lb.	11,000	6,910	3,165	522	17,375	11,030	6,035	2,160	25,290	17,525	9,510	3,925

*See Table I, p. 479, in last week's issue. ** For ranges over 2,000 miles, the increased weight due to overload equals approximately the fuel increments weight.

CARGO AIRCRAFT

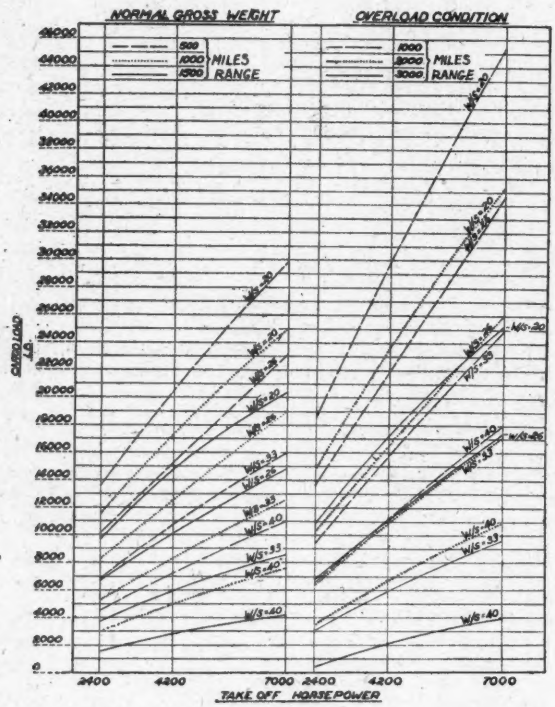


Fig. 6. Effect of increasing engine sizes at four wing loadings on cargo load at different ranges.

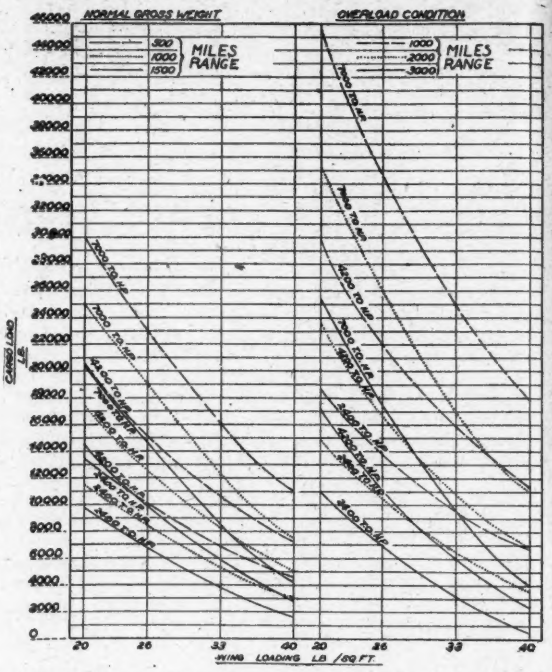
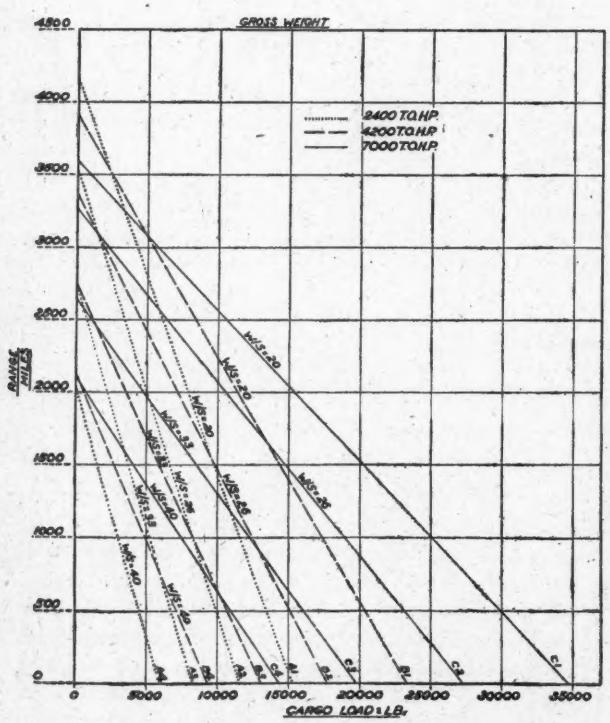


Fig. 5. Effect of increasing wing loading for three engine sizes on cargo loads at different ranges.



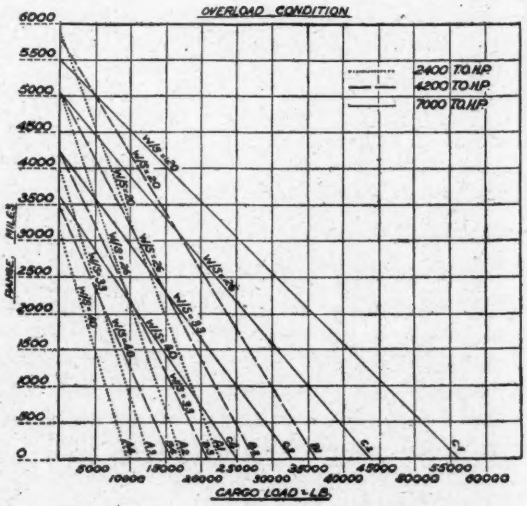


Fig. 4. Cargo load—range diagram.

structural and design efficiency, formula (2) does not account for power efficiency. It is believed that both of these items are important to such an extent that they should be accounted for in an overall efficiency formula.

It is suggested that, by a combination of both, a satisfactory formula could be devised.

By using formula (2) and adding to it a correction factor for fuel cost per weight of cargo carried, it is believed that a realistic compromise will be attained. As can be seen from the foregoing discussion and charts, the aircraft of higher wing loadings will carry much less cargo per gallon of petrol and oil. Also with the increasing ranges, much less cargo will be carried per gallon of fuel.

For example, operating under normal gross weight

CARGO AIRCRAFT

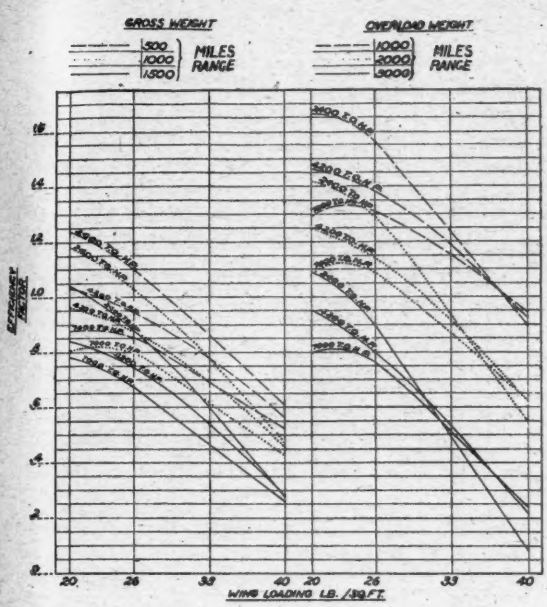


Fig. 7. Variation of efficiency factors with different wing loadings at three engine sizes.

for a 500 miles' range, the aircraft A1 will carry 13,485/1,835=7.35 lb. of cargo per 1 pound of fuel increment, while aircraft A4 will carry only 4,557/1,455=3.132 lb. of cargo per 1 pound of fuel increment. For 1,000 miles' range, the aircraft A1 will carry less than one-half of the above value of cargo per 1 pound of fuel increment, that is, 11,650/3,570=3.17 lb., while aircraft A4 will carry only 3,102/2,910=1.065 lb. of cargo per 1 pound of fuel increment weight. For a range of 2,000 miles, this ratio will decrease to 7,980/7,340=1.087 value for aircraft A1, while for aircraft A4 this ratio will be 192/5,820=0.033.

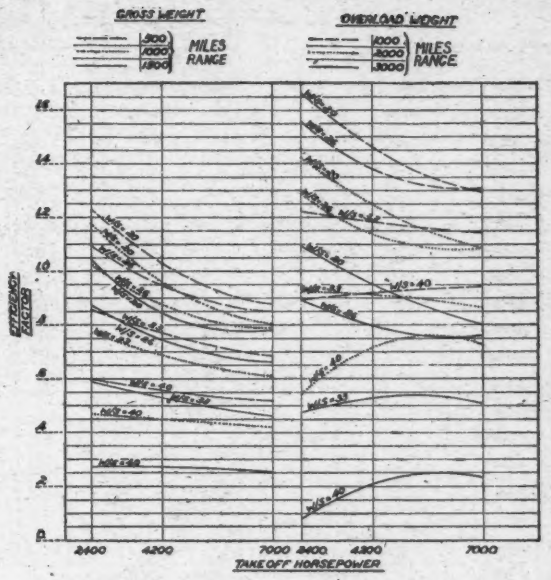


Fig. 8. Variation of efficiency factors with different engine sizes at four wing loadings.

Assuming the cost of petrol to be 15 cents per gallon, the above values correspond to the following approximate costs of fuel per ton mile:—

For 500 miles' range aircraft A1, approximate cost of fuel per ton mile will be

$$\frac{2{,}000 \times 15}{735 \times 500 \times 6} = 1.36 \text{ cents.}$$ Aircraft A4 3.19 cents.

For 1,000 miles' range: Aircraft A1 1.57 cents. Aircraft A4 4.69 cents.

For 2,000 miles' range: Aircraft A1 2.3 cents. Aircraft A4 75.7 cents.

Since fuel cost represents approximately 25 per cent. of total flying and operating cost for 500 miles' range, the formula is then assumed as follows:—

$$\text{Efficiency factor} = \frac{\text{Cargo load}}{\text{Weight empty}} \times \frac{\text{Range}}{\text{Flying time} + \text{Handling time}} \Big/ \text{Landing speed} + \frac{\text{Cargo load}}{30 \times \text{Fuel increments weight}}$$

the last member of the equation representing the fuel efficiency factor.

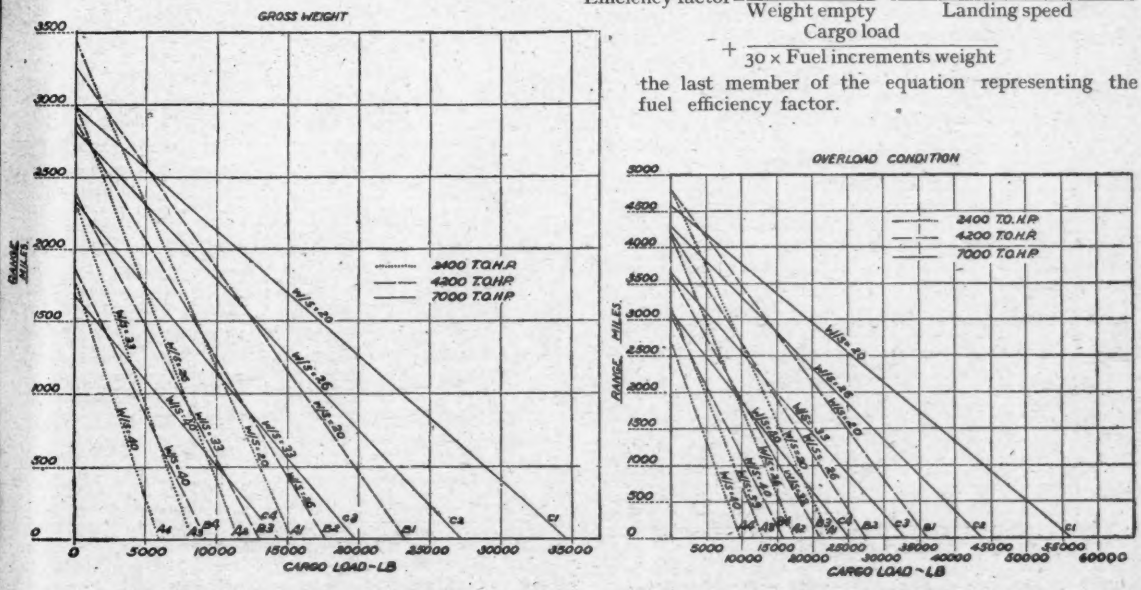


Fig. 9. Cargo load-range diagram (30 m.p.h. headwind) at normal gross and at overload weights.

CARGO AIRCRAFT

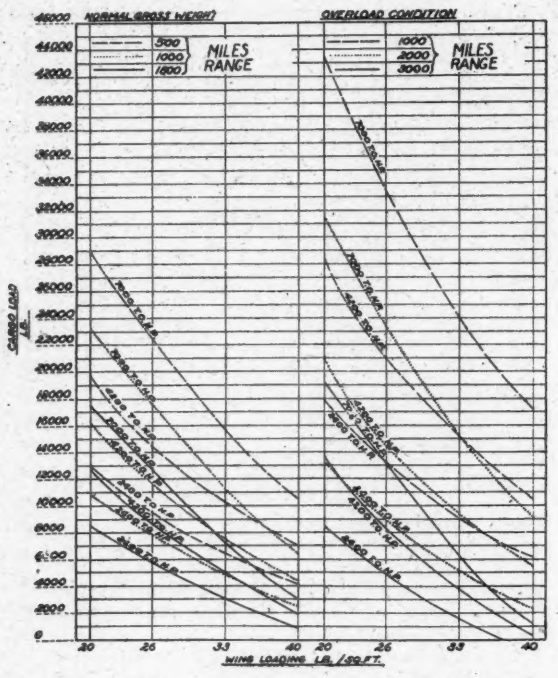


Fig. 10. Effect of increasing wing loading for three engine sizes on cargo loads at different ranges (30 m.p.h. headwind).

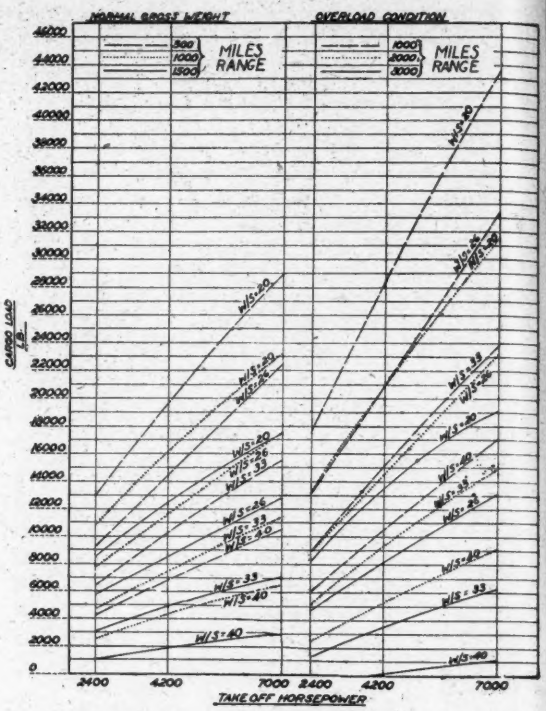


Fig. 11. Effect of increasing engine sizes at four wing loadings on cargo load at different ranges (30 m.p.h. headwind).

The constant, 30, was established to obtain the proper magnitude relative to the efficiency factor resulting from the first portion of the equation.

Taking the corresponding values from Tables I and II, and allowing two hours for handling time (this allowance being large enough to account for such items as taxi-ing and climb), the efficiency factors are calculated in Figs. 7 and 8. Fig. 7 gives the efficiency factors variation with different wing loadings at three engine sizes, for 500, 1,000, and 1,500 miles' ranges at gross weight, and 1,000, 2,000, and 3,000 miles overload weight conditions. Especially at the overload weight conditions for the biggest engine sizes, the efficiency factors are about equal for wing loadings of 20 and 26 lb./sq. ft., these efficiencies being substantially higher than wing loadings of 33 and 40 lb./sq. ft. As would be expected, the efficiencies decrease considerably for greater ranges.

In Fig. 8 are plotted the efficiency factors for four different engine sizes for 500, 1,000 and 1,500 miles' ranges at normal gross weights, and 1,000, 2,000, and 3,000 miles' ranges at 20 per cent. overload weight conditions. In general, it can be stated that the variation for different engine sizes is much less important than that for different wing load-

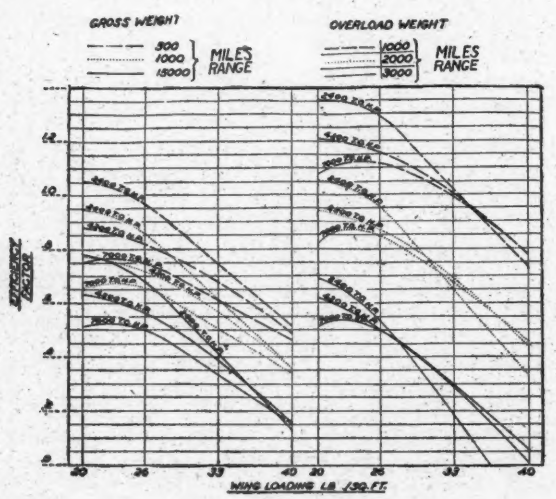


Fig. 12. Variation of efficiency factors with different wing loadings at three engine sizes (30 m.p.h. headwind).

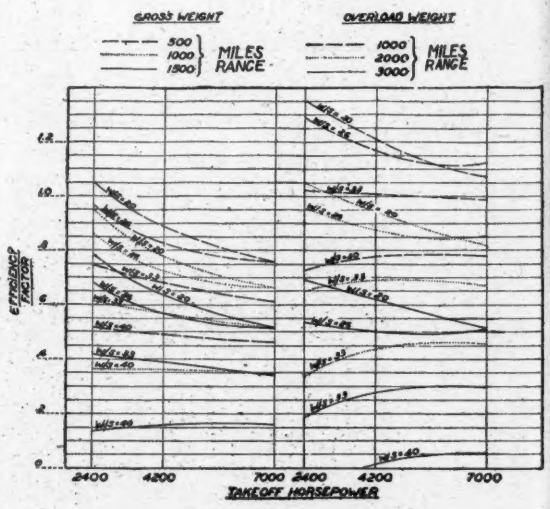


Fig. 13. Variation of efficiency factors with different engine sizes at four wing loadings (30 m.p.h. headwind).

TABLE III.—AIRPLANE CARGO LOADS AT DIFFERENT RANGES AT 30 M.P.H. HEAD WIND

		2x 1,050 Merlin H.P. Engines, 2,400 T.O. H.P.				2x 1,800 Merlin H.P. Engines, 4,200 T.O. H.P.				2x 3,050 Merlin H.P. Engines, 7,000 T.O. H.P.			
1	Airplane designation*	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
2	Cargo and fuel increments weight, lb.	15,320	11,710	8,395	6,012	23,405	17,750	13,125	9,420	34,650	27,345	19,870	14,455
3	Cruising speed at 10,000ft. (30 m.p.h. headwind), m.p.h.	142	161	177	187	151	176	197	215	160	189	214	238
4	Fuel increments weight per hour, lb.	630	630	630	630	1,080	1,080	1,080	1,080	1,830	1,830	1,830	1,830
5	Maximum range (no load), miles	3,450	2,990	2,350	1,770	3,270	2,890	2,390	1,870	3,000	2,830	2,320	1,880
6	Fuel increments weight at 500 miles, lb.	2,220	1,955	1,780	1,085	3,580	3,070	2,740	2,510	5,720	4,840	4,275	3,840
7	Cargo load at 500 miles, lb.	13,100	9,755	6,615	4,327	19,825	14,680	10,385	6,910	28,930	22,505	15,595	10,615
8	Fuel increments weight at 1,000 miles, lb.	4,440	3,910	3,560	3,370	7,160	6,140	5,480	5,020	11,440	9,680	8,550	7 680
9	Cargo load at 1,000 miles, lb.	10,880	7,800	4,835	2,642	16,245	11,610	7,645	4,400	23,210	17,665	11,320	6,775
10	Fuel increments weight at 1,500 miles, lb.	6,660	5,865	5,340	5,055	10,740	9,210	8,220	7,530	17,160	14,520	12,825	11,520
11	Cargo load at 1,500 miles, lb.	8,660	5,845	3,055	957	12,665	8,540	4,905	1,890	17,490	12,825	7,045	2,935
	Overload Conditions												
12	Cargo and Fuel increments weight, lb.	22,520	17,230	12,705	9,612	36,005	27,410	20,765	15,720	55,650	43,445	32,610	24,955
13	Cruising speed at 10,000ft. (30 m.p.h. headwind), m.p.h.	134	153	168	178	144	168	190	209	151	182	208	231
14	Maximum range (no load), miles	4,800	4,200	3,400	2,710	4,800	4 260	3,650	3,040	4,590	4,310	3,700	3,150
15	Fuel increments weight at 1,000 miles, lb.	4,700	4,120	3,750	3,540	7,500	6,430	5,690	5,170	12,120	10,050	8,800	7,930
16	Cargo load at 1,000 miles, lb.	17,820	13,110	8,955	6,062	28,505	20,980	15,075	10,550	43,530	33,395	23,810	17,025
17	Fuel increments weight at 2,000 miles, lb.	9,400	8,240	7.500	7,080	15,000	12,860	11,380	10,340	24,240	20,100	17,600	15,860
18	Cargo load at 2,000 miles, lb.	13,120	8,990	5,205	2,532	21,005	14,550	9,385	5,380	31,410	23,345	15,010	9,095
19	Fuel increments weight at 3,000 miles, lb.	14,100	12,360	11,250	10,620	22,500	19,290	17,070	15,510	36,360	30,150	26,400	23,790
20	Cargo load at 3,000 miles, lb.	8,420	4,870	1,455	—	13,505	8,120	3,695	210	19,290	13,295	6,210	1,165

* See Table I, p. 479, in last week's issue.

ings. This effect is still more pronounced as the range requirements increase. It can be seen that, for example, at normal gross weight with medium engine sizes of 4,200 h.p., the drop of efficiency for increased range from 500 miles to 1,000 miles at wing loadings, at 20 or 26 lb./sq. ft. is less than 7 per cent. of the one obtainable at 500 miles' range. The corresponding efficiency decrease is 11 per cent. for 33 lb./sq. ft. wing loading, and 24 per cent. for 40/sq. ft. wing loading. At the same time, the efficiency at 500 miles' range for 33 lb./sq. ft. wing loading for this particular engine size is only 75 per cent. of that at 20 lb./sq. ft. wing loading, while the one for 40 lb./sq. ft. wing loading is only 54 per cent.

In the overload weight condition, even for long ranges, the efficiencies of aircraft with low wing loadings are greatly improved. As would be expected, the aircraft of high wing loadings do not show such great improvement but become actually as low as 25 per cent. of those of low wing loadings.

Head-wind Effect

In order to ascertain the effect of winds on the performance and efficiency factors, the effects of 30 m.p.h. head wind have been analysed. In table III the cargo loads at different ranges with 30 m.p.h. head wind are compiled. The reduced cruising speeds are given in line 3 for normal gross weights and in line 13 for overload conditions.

With the same procedure as before, the values of Table III are again plotted in the Cargo Load-Range Diagram, Fig. 9. Comparison of this figure with Fig. 4 shows the shortened ranges, especially those of aircraft with low wing loadings. Fig. 10, showing the effect of increased wing loading for three engine sizes on cargo loads and ranges at 30 m.p.h. head wind, gives good comparison of its lower values with Fig. 5. With increasing distances, the cargo load is substantially reduced. The same is true in Fig. 11, which shows the effect of increasing engine sizes at four wing loadings on cargo loads at different ranges at 30 m.p.h. head wind, as compared with Fig. 7.

The efficiency factor variations are presented in Figs. 12 and 13. As would be expected, the wind effect on efficiency factors is more pronounced for slower aircraft, that is, for those with low wing loadings. For bigger aircraft with bigger engines, it would approximately equalise the efficiency factors at 20 and 26 lb./sq. ft. wing loadings at normal gross weight. Wing loadings beyond 26 lb./sq. ft., however, stay highly inefficient, as shown in Fig. 13. For example, at normal gross weights for aircraft with 2,400 h.p. engines at 500 miles' range, the efficiency factor at 40 lb./sq. ft. wing loading is less than one-half of the one at 20 lb./sq. ft. wing loading, and about 53 per cent. of the one at 26 lb./sq. ft wing loading. For aircraft with 7,000 h.p. engines, 500 miles' range, the curves flatten and this ratio is improved to 61 per cent. of those with wing loadings of 20 or 26 lb./sq. ft. For greater ranges, however, the efficiency factors for wing loadings above 26 lb./sq. ft. decrease at a higher rate.

Similar conditions exist at the overload weight.

From the point of view of economical cargo and freight transportation where cost must be closely watched, it seems that for an efficient cargo aircraft design of such type as presented in this study, the optimum wing loading corresponding to power loadings of 15 to 11.5 lb. per take-off horse-power lies between 20 and 26 lb./sq. ft. Such combination of wing and power loadings gives not only the best load carrying performance, but also the best efficiency.

NEW 7-CYLINDER CYCLONE

SPECIFICALLY designed to provide airframe manufacturers with an air-cooled radial engine in a power range not covered by designers during the past eight years, a new seven-cylinder bright Cyclone aircraft engine using inexpensive low-octane fuel and developing 700 horse-power, has been announced by G. W. Vaughan, president of the Wright Aeronautical Corporation and the Curtiss-Wright Corporation.

Prototype models of the engine, test-flown in standard aircraft, have already demonstrated satisfactory power output, fuel economy, and smoothness of operation, it is claimed. Close resemblance to the Cyclone 9 makes possible interchangeability of many parts of the nine-cylinder and seven-cylinder types and simplifies maintenance problems.

"Indicator" Discusses Topics of the Day

Grading the Amateur

A Suggested Licensing Arrangement for the Private Pilot: "Experience Training" in Two Stages: Flight Authorisation as a Means of Control and Discipline for the Inexperienced

THE word freedom, as we all know quite well, is a much-abused one. At one end of the scale it may mean merely someone's right to do what he likes with his "own"—at whatever cost to the rest of the community. At the other end it may simply mean the right of free political (or other) thought or speech. But since we must all live with one another, for better or for worse, it has always been clear that certain "freedoms" must be sacrificed for the benefit of society in general.

Although war conditions have necessarily increased the number of restrictions on individual freedom of action, these restrictions by no means constitute a new and temporary situation. The principle is as old as the conception of law and order. Apart from the prospective tax-incomes involved, someone must know, for instance, when a member of the community has purchased a prospectively lethal firearm or a potentially lethal dog. And someone must obviously be in a position to prevent a blind or paralytic individual from using a car or an aircraft.

Until comparatively recently, anyone who was prepared to perjure himself could obtain a car licence and forthwith drive away into a Cup Final crowd on the payment of a purely nominal sum. And, at least in theory, anyone who could pass a simple medical examination and an even simpler series of flying tests could buy a flying machine and forthwith spin into the local market square. Provided that he was not flying "for hire or reward" and was prepared to take his own accident risks, the "A" licence pilot could purchase a fast and lethal multi-engined device with which to plough, in an uncontrolled take-off swing, through the clubhouse on the other side of the airfield.

Self Preservation

Fortunately, the average novice pilot's own natural instinct of self-preservation prevented him from doing any such thing, and, in any case, his potential freedom was adequately curbed on all sides. If he had shown no signs of being a sensible and competent pilot his instructor would not have let him go solo; this same instructor would have discouraged the initial purchase and certainly the initial uninstructed take-off; and the seller would, in any case, and for the sake of his own prestige as a manufacturer or agent, have taken steps to prevent any such premature finale.

Nevertheless the possibility was there, and is likely to be more prominent in the future. Until recently, this flying business has been in the nature of a "carefully guarded secret," known only to a select band of instructors and old-timers whose expressions of opinion and whose judgments were accepted as final and binding. There may come a time when, with the help, perhaps, of ill-informed writings of one sort and another, the general public may take suddenly to the air in a series of contraptions and in a variety of weather conditions on the understanding that it is "all quite easy." And so it is—but not quite as easy as all that. Almost anybody can be taught to fly and a very big proportion can be made into sound, careful and safe pilots. But it takes time, good training, and a thorough understanding of the whys and wherefores.

Obviously, there will need to be an overhaul of the amateur licence situation as soon as the war is over. Although, because of the good sense of club instructors and others, it was not then altogether obvious—the licence arrangements in pre-catastrophic days were ludicrous. They dated, with very little change, from the early years of flying when it was something of a miracle to be airborne at all, and when the tests for an R.Ae.C. Certificate could not be made more difficult owing to the limitations imposed by the aircraft in use. As far as I can remember, all that was necessary for me to do, even in the late twenties, to be considered a theoretically competent aeronaut, was a series of figure-of-eights, with a barograph to show that I had maintained an approximate height of eight hundred feet (!); a "height" test followed by a rather approximate (and lightly watched) motorless "spot" landing from some particular altitude; and the verbal production of a reasonably accurate series of replies to questions covering everything from the laws of passage over alien countries to the kind of lights carried by out-of-control navigable balloons at night. Thereafter, in order to obtain a renewal of this licence, it was only necessary for me to put in a total period of not less than three hours annually as the pilot of a heavier-than-air machine.

Ground "Cramming"

The conditions for a "B" licence were very little less archaic and could be rapidly covered, with a little air and ground "cramming," during a period of weeks. But, here, arrangements of employment and insurance, with the fact that the licence had to be endorsed for each separate type, brought things under control, and the comparative ease of the "examinations" and requirements at least made it possible for impecunious enthusiasts to "earn while they learnt." If the minimum experience requirements had been increased to suit general transport flying conditions, many scores of potentially excellent professional pilots would have been unable to continue with their self-training. So we can leave the professional licences happily in the hands of the operators, pilots' unions and the Air Ministry.

The question is—what form should the amateur licence (or licences) take in immediately post-war years? For very much the same reasons as those for which an easy "B" licence may be considered to be to everyone's advantage, some form of easy preliminary licence will need to be retained so that the civil-trained amateur may be in a position to gain the necessary experience in comparative freedom. But this freedom should be modified until such a time as he or she has obtained the requisite number of hours in different "exercises" and is able to pass fairly stringent flying tests and examinations. Thereafter, a higher class of licence would give its owner complete freedom within the bounds of air law and usage in different areas and countries.

During the intermediate period there would be no need for the amateur to feel any obvious restrictions unless he happened to be a particularly moronic type in whom the instructors felt no confidence. And if, by reason of age or general inaptitude, he was unable to gain the higher class he would still, as an owner, hirer, or club member, be able to fly about the place more or less as he pleased. But with one largely unnoticed restriction: he would not be permitted to authorise his own flights.

Instructors or flying control officers would need to "vet." his plans before he would be permitted to take off, and any infringement of this rule, or deviation from the prearranged schedule, would possibly involve him in the suspension, for a time, of his "primary" licence. The

GRADING THE AMATEUR

whole system would, in fact, be rather similar to (but more "civil" than) that standardised in the Air Force. There should never be any question of difficulty or unpleasantness over the authorisation. The primary licencee would simply go into conference with the instructor, or official concerned, and the presentation of an authorisation chit would normally be in the nature of a formality; at the end of the brief conference the averagely constituted novice would have been given either a chit or some very convincing reasons why such and such a flight was not deemed to be reasonably safe.

Authorisation would, of course, cover all manner of flights in addition to cross-country trips in familiar aircraft. Through it there would be permission to fly new types, and to practise particular aerobatic and other exercises. After an intermediate stop during a tour, of course, permission would again have to be obtained after consultation with the met. people. In all, the novice might, with such a system in full force, be in a much better position to obtain ample experience, and he would always be able to look forward to the not-so-distant day when he would be free even of these minor restrictions—which were in force, largely though unofficially, during pre-war days.

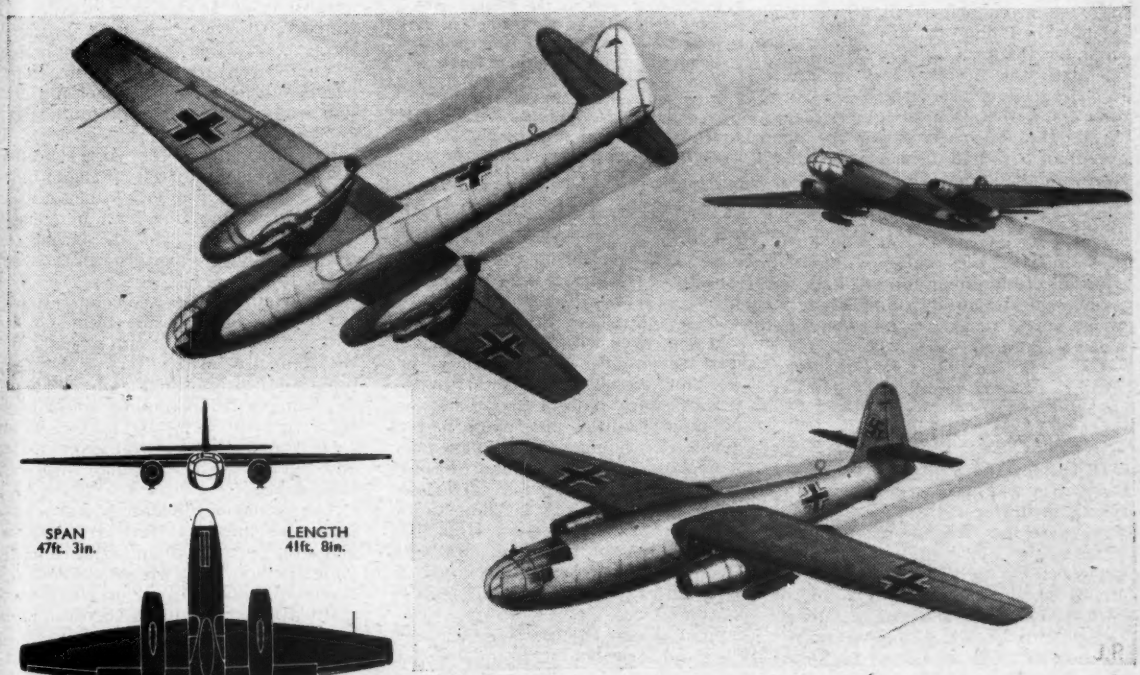
I will not attempt to lay down any possible standards for the higher grade of licence, but I do feel that the amateur should, in addition to possessing good all-round experience covering several hundred flying hours, know a great deal more than he used to know about the working of his aircraft, general aerodynamics, meteorology, and D.R. navigation. None of these things are quite as important as actual flying experience, but they form a guide to his general intelligence and keenness, and would prevent the less experienced pilot (as well as quite a few old-timers) from falling into the various handling and weather traps which still tend to kill good pilots off at all stages in their careers.

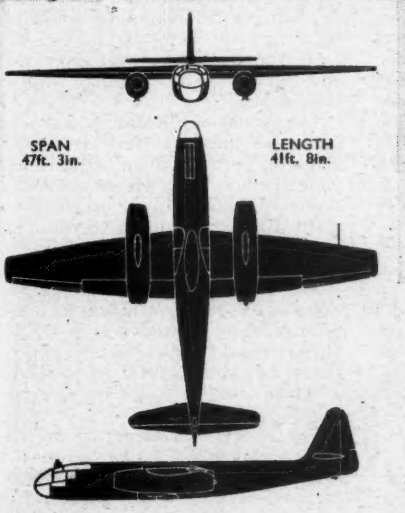
The basic point is that, since there must be some form of control for all flying, such a system of grading and preliminary authorisation would provide full control for all amateur flying by pilots whose skill and experience are in doubt. In addition, the dual licence arrangement would provide a means of disciplining the more reckless souls without anomalies or too great a hardship. The convicted "bad" pilot would merely be down-graded for a period. He would still be able to fly, but the somewhat boring process of continuous authorisation would remind him of his misdeeds. And, of course, if he chose again to be lethally anarchistic during his re-probationary period he would risk losing even his primary ticket. The pain and loss of self-respect would be greater for the more experienced and from whom breaches of good flying manners can be less easily tolerated—so that deliberate naughtiness would automatically be more heavily punished than mere forgetfulness or inexperienced exuberance.

I hand the idea to those who will be in control of private flying—for what it is worth.

"INDICATOR."

Arado Ar 234 Reconnaissance Bomber





ARADO Ar 234: This is the latest of the German "squirt jobs" to put in an appearance on what remained of the Western Front at the time. But unlike the Me 262, it has only been used in small numbers for reconnaissance and has avoided combat, though it can carry small bombs under the jet-unit nacelles. The main wheels of the tricycle undercarriage retract into the underside of the fuselage; pilot's cockpit is in the glazed nose. The Ar 234 is powered by two Junkers Jumo 004 jet reaction units underslung beneath the cantilever high wings, and top speed is reported to be something over 400 m.p.h. It is easily distinguished from the Me 262 which has a teardrop cockpit cover amidships and is a low-wing design with sharply backswept leading edges and tapered trailing edge on the centre section.

In Spite of Difficulties

How an Independent British Air Line has Managed to Carry On, Even During the War

By C. BRUNNING

ALLIED AIRWAYS (GANDAR DOWER), LIMITED, was founded in 1934 under the title Aberdeen Airways, Limited. In 1936 the name was changed to the present title, but the constitution of the firm remained unchanged. The object was to run air lines from Aberdeen Airport, Dyce, and, in 1934, this was no easy task. Airfields were few, and so were believers in aviation.

It was decided to operate to Thurso, Caithness and Orkney Island. This meant that extensive survey work had to be carried out because there were no landing grounds available at either place.

Thurso was the key to the Orkneys and the centre of a busy tourist traffic, and from it a boat crossed daily to Orkney. Except for a few enthusiasts there was little support from the town folk.

Many weary weeks were spent searching for a suitable site, and although in those early days landing grounds had only to be sufficiently large for the type of aircraft to be operated, the problem was difficult. In order to start a service two separate runways were established, one East-West, the other West-South. The ground of both had to be levelled, and furrows and ditches filled and rolled, before the Air Ministry would grant a licence.

One year later, however, the East-West runway was enlarged by the addition of adjoining ground, and extensive work done, including filling-in of a burn, removing and burying several hundred yards of telegraph wires, and burying over an even greater distance some high-tension cables.

"Free" Enterprise

In Orkney the position in 1934 and early 1935 was just as difficult. The two main towns, Kirkwall and Stromness, were not rich enough to build airfields, and a levy on the rates would have been too high. They were, therefore, pleased to leave the making of airfields and the running of air lines to "free" enterprise and to pioneers.

Again it was necessary to spend many weeks locating sites, and although the company found a suitable site near Kirkwall of which the Air Ministry approved and on which drainage was commenced, they were later advised that a licence could not be granted as the location was too close to an existing airfield. It is interesting to note that at the present time this particular site is a first-class R.A.F. airfield.

The company then went to the town of Stromness and found support, not financially but in the form of suggestions as to possible locations for an airport. However, the majority of people had no idea of what was really required for an Air Ministry licence, and weeks were spent in trudging around daily, looking at fields. Finally a site was found at the Bridge of Waithe, Howe, Stromness, which was approved by the Air Ministry.

Here again the ground had to be levelled, drains laid, and a wide ditch filled-in. Telegraph wires running along one boundary of the airfield had to be buried underground.

On May 27th, 1935, the company operated its first daily air service from Aberdeen Airport, Dyce, to Thurso and Orkney. During the first week only three passengers were carried, and the revenue was £8 15s.

ALLIED Airways (Gandar Dower), Ltd., is the only British air line to have continued independent operation from the outbreak of war to the present time. Some of its troubles and tribulations are recorded in this article. The company shares with others the threat of the recent White Paper either to join one of the suggested new corporations or to go out of business. No goodwill is recognised, nor is it intended that there should be any recompense for development expenses.

As a comparison, the air line is now carrying, even with the restrictions of war travel, over 200 passengers per week and annual receipts total £40,000.

In the early days of 1935 there were no radio facilities and pilots had to develop a "homing" sense. The company later added the Island of South Ronaldsay to its route and carried out the usual survey work, levelling, drainage, etc., at St. Margaret's Hope. In the autumn of 1935 hangars were erected at Thurso and Stromness to cope with the trans-Pentland summer season traffic.

In 1935 also the company surveyed Shetland for a landing ground as that island wished to be connected by air to the mainland. The country did not, however, lend itself to a civil airfield. Several sites were inspected by the Air Ministry and rejected, although on one site the company was prepared to carry out *any* work necessary, but the Air Ministry would not agree.

In 1936 the Sumburgh Land Company at Sumburgh, Shetland, gave up the golf course, and this was formed into a landing ground, the use of which was granted to two companies.

The first Aberdeen-Shetland service via Thurso and Orkney was inaugurated in June, 1936. Radio stations were by this time available at Kirkwall and Shetland but not at Dyce.

Competition

During the years 1935-1939 the company operated against stiff competition on all routes. It also suffered the booking ban on tickets being sold by recognised travel agencies. This, however, did not deter the company, which continued to operate.

On January 1st, 1939, "peace" was granted in the form of Licensed Routes. The Government had set up an Air Transport Licensing Authority to eliminate wasteful competition and to ensure that the public was served satisfactorily.

Although all Allied Airways routes were objected to during a hearing in January, 1939, which lasted four days, the company was successful in being given the sole right to operate from Aberdeen-Thurso-Orkney-Shetland. It shared the Thurso-Kirkwall route with another company.

In July, 1939, the direct route Aberdeen-Shetland was inaugurated. This service proved successful since it cut down flying time and in consequence fares were reduced. Owing to the war, however, this route was banned.

Reverting to 1936, the company decided to operate a line from Great Britain to Norway, and officials of the company visited Norway for the purpose of establishing a line. There were no British shipping companies carrying passengers, and 42,000 were carried annually between Newcastle and Norway by a Norwegian shipping company.

The managing director was successful in his quest in Norway and was given the privilege of an audience with King Haakon, who wished the service success. A five-year concession was granted to operate from Aberdeen and Newcastle to Stavanger and Oslo.

In 1937, the British Government stated that they could not see anything in this route, although its potentialities were pointed out to the Air Ministry and to every Member of the House of Commons, including the use which it could be in the event of hostilities in Europe.

The line was inaugurated in July, 1937, and operated for two seasons. It carried the Norwegian mail to Britain.

(*Continued at foot of page* 511.)

CIVIL AVIATION NEWS

LANCASHIRE INTEREST

DIRECT services from Manchester to such European countries with which Lancashire had close business ties are asked for by the Manchester Chamber of Commerce.

In a request sent to the Minister for Civil Aviation, it is stated that these direct air communications would be of valuable service to the development of export trade.

ARGENTINE ORDER

A DECREE establishing national air space sovereignty over the State's territory has been issued by the Argentine Government.

Argentine air transport lines will extend their services to neighbouring countries, while international transport lines may enter the country and leave it freely after complying with various rules as to route and airports used.

CANADIAN PLANS

CANADA is interested in establishing a trans-Pacific service to Australia, in co-operation with Great Britain, Australia and New Zealand.

Declaring that Canada's policy was co-operation with Empire Air Services and not competition, Mr. Norris Wilson, Canadian Civil Aviation Director, in an interview, said that a service to South America, in co-operation with Great Britain, was also contemplated.

The present trans-Atlantic soldiers' air mail service would serve as a foundation for the post-war commercial service.

FOR FEEDER SERVICES

AMERICAN feeder airline operators have been warned to expect lean years in the immediate post-war period. A survey concluded that they might be able to fix passenger rates at only 3.5 cents (about 1¾d.) per mile should a suitable type of aircraft become available for feeder operations. Substantial economies must be obtained first through efficient aircraft and engine design.

Indicating that at present no such specialised aircraft is available, the survey stated that should it be possible to operate on a direct flying cost of 17 to 20 cents (about 8½-10d.) per aircraft mile, and allowing for indirect expenses being double this figure, passenger rates per mile of 3.5 cents could be achieved.

The envisaged ideal feeder liner type, the survey concluded, might cost from 50,000 to 70,000 dollars (from £12,500).

IN SPITE OF DIFFICULTIES

(*Continued from page 510*)

If the war had not intervened this line would have met with the success it merited, but the company lost £16,000-£18,000 in pioneering this route.

When war broke out all air lines which did not operate over water were closed, and thus Allied Airways was the only independent air line left to operate from Aberdeen to Orkney and Shetland. The passengers consisted mainly of Government priority personnel, Servicemen and women and merchant seamen. It should not be forgotten that the mail contract from Aberdeen to Shetland, which commenced in November, 1937, continued to be carried daily and became a great boon to the Forces stationed in these outlying districts.

Operation during wartime has been extremely difficult, often entailing the management working fourteen and even sixteen hours a day. Shortages of pilots, staff and engineers did not help, and then there were difficulties over obtaining spare parts and having repairs carried out. Suppliers and manufacturers had to give precedence to the fighting part of the war effort and Civil Aviation could only collect what crumbs there were.

Until 1942 it had not been possible to purchase aircraft, new or second-hand, and the aircraft which have been used throughout the whole war period have therefore been DH89A Rapide or Dominie, no other types being available.

The company, having traversed ten years of hard work, naturally looked forward to the days of peace when they could extend their activities and improve their organisation. The White Paper appears to dash any such hopes.

FOR THE CARIBBEAN

AN air freight service in the Caribbean is to be operated by the Aero Transport Corporation, whose parent company is the Siple Air Transport Company of Montreal.

Capt. W. C. Siple, former superintendent of civilian flying personnel of the R.A.F. Transport Command at Dorval, Montreal, is the president of the company recently organised here, with a view to operating a coast-to-coast freight service in Northern Canada.

The company purchased from the Canadian Government through the War Assets Corporation twenty of the famous Stranraer flying boats, British-designed twin-engined aircraft, built at Canadian Vickers, Ltd., Montreal, which have been used throughout the war on coastal command work and which have been flown to all parts of the world.

The Caribbean aerial freight service will start, Capt. Siple stated, at Tampa, Florida, as soon as route details have been worked out. These routes will take in Cuba, Haiti, Dominican Republics, Puerto Rico, Trinidad, Venezuela, Colombia, Panama Canal Zone, and towns in Mexico and Jamaica.

It is understood that the Siple Air Transport Co. will be an all-Canadian company.

AIRWORTHINESS

THE Vice-chairman of the U.S. Civil Aeronautics Board, Mr. Edward Warner, in a paper presented to the Society of Automotive Engineers, outlined progress in the development of an international civil aviation airworthiness code.

Mr. Warner emphasised that the draft annexes appended to the final documents at the Chicago International Civil Aviation Conference (I.C.A.C.)—which include civil airworthiness standards—are subject to a continuing process of evolution, and quoted two arguments in favour of international standardisation, which are: (1) The facilitation of world aircraft trade. (2) The reduction, if not elimination, of the possibility of competition either between manufacturers or among airlines in the lowering of costs by lowering of safety standards.

He said one of the arguments against standardisation is "the administration complication of the regulatory process," but that, obviously, it would be advantageous both for manufacturers wishing to export and for purchasers wishing the widest possible range of choice, if they could be assured that aircraft eligible for certification as airworthy in one country would be eligible in all others as well.

Mr. Warner spoke of U.S.-British discussions in 1942 and 1943 on the desirability of securing the greatest possible measure of uniformity, at least among as many as possible of the leading aircraft manufacturing countries, if not among all nations. Last summer in bi-lateral talks on civil aviation between the U.S. and several other countries, the desirability of internationally standardised practices was agreed upon and followed by preparation of a first draft of a suggested code, Mr. Warner said. The draft was laid last November before the technical committee of I.C.A.C. in Chicago.

The final I.C.A.C. resolutions accepted the draft annexes "as constituting models of the desirable scope and arrangement." All participating governments were asked to study the annexes and by May 1st, 1945, submit suggestions for additions or changes.

As soon as the provisional international civil aviation organisation have been established in Canada, Mr. Warner continued, the further development of the airworthiness code may be expected to come into the hands of an airworthiness subcommittee, reporting to the Committee on Air Navigation and under supervision of the Provisional Council.

The provisional body cannot make any of the technical annexes an integral part of the permanent air convention. The convention setting up the permanent world air body will come into force only after it has been formally ratified as a treaty by at least 26 governments. It would then require a two-thirds vote of the permanent council to establish formally the annexes to the permanent convention, including that of airworthiness-standardisation.

Although the I.C.A.C. did not provide for compulsive acceptance of the technical code by any member nation of the projected world air body, he was confident that the desirability of a high degree of international uniformity in a great many matters will be generally recognised, and that the prestige of the standard adopted by the international council will be so great that national adherence to them will be spontaneous and unquestioning.

CIVIL AVIATION NEWS

SWISS AIR

A RECENT survey from the Swiss Air Office concerning the activities of Swiss civil aviation in 1944 gave these comparative figures for 1941, 1943 and the last full pre-war year of operations:—

	1938	1941	1943	1944
Number of flights ..	82,127	1,880	2,387	2,003
Flying hours	29,112	1,071	974	758
Aggregate distance (1)	5,398,605	242,266	201,102	142,775
Passengers carried ..	122,937	4,668	5,841	4,152
Mail conveyed (2) ..	628,014	36,285	73,322	61,452
Freight conveyed (2)	322,173	45,099	63,331	29,820
Excess luggage (2) ..	284,825	22,539	26,662	23,332

(1) = Kilometres; (2) = Kilogrammes.

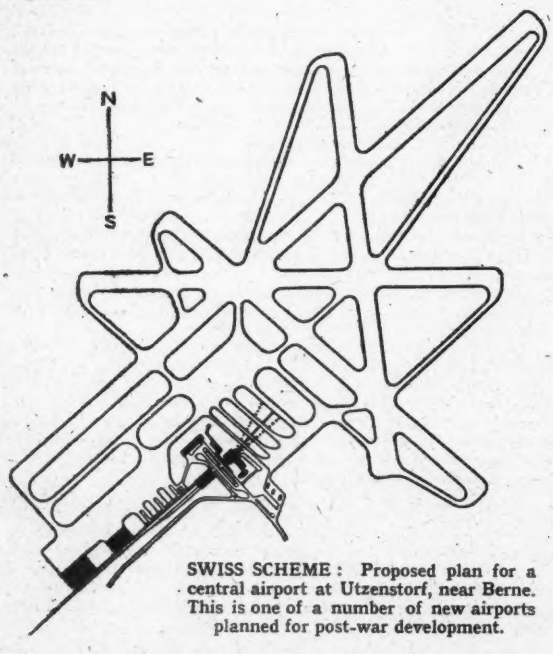
The contraction in 1944 was exclusively due to the discontinuance of the Swiss air services, while flying schools had shown intensified activity. There was no private flying in 1944.

Between January 1st and January 29th, 1943, the Swiss Air operated the Zurich—Stuttgart—Berlin daily service (465 miles, 749 km.); thereafter the service was restricted to the Zurich—Stuttgart section (113 miles, 182 km.). This reduced service was discontinued on August 17th, 1944, following upon the destruction, at the Stuttgart aerodrome, of the Swiss Air Douglas airliner DC2, said to have been due to an American air raid in 1944; this Swiss air service, the only one operating in recent years, covered a mileage of 46,922 miles (75,558 km.) compared with 91,236 miles (146,918 km.) in 1943 and carried 2,187 passengers (4,738).

In December, 1943, the company's share capital was increased from 800,000 francs to 1,000,000 francs.

As far as the financial results are concerned, the company's working receipts totalled 1,890,000 francs in 1943, compared with 2,860,000 francs in 1942. Passenger and goods receipts regressed in 1943 from 1,500,000 (in 1942) francs to 370,000 francs, postal receipts from 510,000 francs to 200,000 francs, and working expenditure from 1,780,000 francs to 1,330,000 francs. In view of the fact that the company's activities had contracted by nearly 90 per cent., it was thought that the statutory provision for depreciation concerning 1942 and 1943 could be dispensed with. The profit and loss account for 1943 closed with a working loss of 6,093 francs.

By the end of 1943 the company's fleet consisted of the following machines: Seven twin-engined Douglas (four DC-3s and three DC-2s) for the regular airlines, and one single-engine Fokker VIIa, as well as a single-engine AC-4 and a twin-engined Dragon DH-89 for whooping-cough flights, air training, etc.



SWISS SCHEME: Proposed plan for a central airport at Utzenstorf, near Berne. This is one of a number of new airports planned for post-war development.

AIR MAIL TO RUSSIA

AIR mail correspondence for the U.S.S.R. can now be accepted for transmission by air to Sweden and thence by air or surface route via Finland.

LISBON-AZORES

PAN AMERICAN Airways advertise ordinary trips from Lisbon to Azores beginning in the middle of this week. The return fare is £20.

A PROPOSAL

A PAN AMERICAN conference to discuss problems of commercial aviation has been suggested by the Chilean periodical, *Aeronautics*.

CANADA-SWEDEN PACT

THE Canadian and Swedish Governments have agreed to bring into force immediately, as between themselves, the International Air Services Transit Agreement, commonly known as the Two Freedoms Agreement, without waiting for it to become generally effective.

The two freedoms of the air which each country makes available to the aircraft of the other are: (1) The privilege to fly across his territory without landing, and (2) The privilege to land for non-traffic purposes.

INTER-ISLAND ROUTES

SOUTH Pacific islands want Pacific civil air traffic to be established as early as possible.

The High Commissioner for the Western Pacific, Mr. Alexander Grantham, disclosed that Australia and New Zealand are being consulted on this matter. The project is to establish a trans-ocean route via Fiji to the U.S. and Canada with supplementary eastern and western branches from Suva in the Fiji Islands, linking the Gilbert and Ellice Islands with the Solomons and the New Hebrides.

SYDNEY–NEW GUINEA SERVICE

THE re-opening of the Sydney-New Guinea air service by Qantas Empire Airways, Ltd., marks the reappearance of yet another of Australia's overseas links, most of which were severed by enemy action in the early days of the war.

Qantas aircraft and pilots are not strangers to New Guinea; during the Japanese advance over the Owen Stanley ranges Qantas flying boats were prominent in the evacuation of civilians and wounded troops.

The service which commenced on April 2nd from Sydney to New Guinea and Papua operated at first a once-weekly frequency, later increased to thrice weekly. C-47s, converted to civil in the Qantas workshops at Brisbane, will be used on the service for the carriage of passengers, mails and freight and will also contribute to a better mail service for troops in the New Guinea and adjacent areas. The route from Sydney includes calls at Brisbane, Rockhampton, Townsville, Cairns, Port Moresby and terminates at Lae.

A REVIEW

WRITING in a recent issue of *Harper's Magazine* on "Freedoms of the Air," Mr. Adolf A. Berle, Jnr., U.S. Ambassador to Brazil, who presided at the Chicago Conference and was Chairman of the American Delegation, says that much of the work of the Chicago Conference consisted of a weary search for a formula by which each country might have an initial allocation of opportunity to fly, but flexible enough to preserve for the public the right to choose the line it desired for foreign air travel or cargo use.

On this point, he writes: "The British stressed the need for order in the air and for limiting competition . . .; the Americans, the need to open the air to opportunity; the Canadians, the need for an evolutionary mechanism by which co-operation might be continuously increased."

Saying it is the "results that count," Mr. Berle writes that the "Two Freedoms" and "Five Freedoms" conventions along with other I.C.A.C. agreements providing for an interim world air organisation, "open whole sub-continents to peaceful air commerce."

As a result of these instruments, Mr. Berle concluded, "The custom of peaceful transit for peaceful planes in peaceful commerce has obtain an acceptance which, if not universal, is at least widespread.

"The custom of peaceful and non-discriminatory commerce by air (under what he calls the rule of equal opportunity), contained in the document of the Five Freedoms, has been accepted by a large community of nations, with every prospect that it will grow," Mr. Berle concluded.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE SUPER CLIPPER

De-icing Problem with Pusher Layout

IN your issue of *Flight* dated April 12th you published a photograph of a model "Consolidated Super-Clipper," to be used by Pan-American World Airways.

This aircraft is powered by six engines mounted on the trailing edge and fitted with pusher-type airscrews. It is to operate at 30,000 ft.

If this aircraft is to operate at such a height it will no doubt be fitted with efficient de-icing gear on the leading edge of its wings, which will, as far as I can see, throw ice back into the pusher-type airscrews.

Can anyone tell me how this difficulty is overcome with pusher-type aircraft? B. NOBLE.

JETS AND TURBINES

Power Developed for Fuel Consumed

I FAIL to agree with some of the points made by Mr. S. H. Prince in *Flight*, April 26th, regarding jet propulsion. He states that the formula $H.P. = \frac{F.V.}{550}$ shows that the power developed by the engine of a jet-engined aircraft depends directly on its forward speed, assuming that the jet develops a constant thrust. Mr. Prince further states that this accounts for the low efficiency at low speeds of this type of aircraft.

According to this statement, a motor car engine, where the resisting forces to motion (equal and opposite to "F") are practically constant at all speeds also gives low efficiency at low speeds. Actually, however, there is no question of efficiency to consider, as this can only be obtained by comparison of the fuel consumption and power developed.

Mr. Prince's method of calculating fuel consumption in pounds per horsepower hour gives no clue as to how the fuel per hour he uses can be obtained, presumably leaving this minor matter to trial. He thus tells us practically nothing in this connection.

Another point. How can the thrust remain constant when the air resistance to the body at sub-sonic speed is in proportion to the square of its velocity? The horse-power of the jet engine, therefore, will increase as the cube of the speed.

A. STONE (Grad. R.Ae.S.).

AIR TRANSPORT TRAINING

Leave it to the Experts

I WONDER if I may be allowed to add my grain of support to the growing weight of informed aeronautical opinion which is championing the cause of the pre-eminent established pre-war training centre, so neatly and succinctly stated in *Flight's* leader of April 12th.

I would like to make it quite clear forthwith that this letter contains only my own personal views, and I am writing as an Air Service Training trained pilot who joined the school as a pupil in 1933 and who was later considered to be good enough to be employed there as an instructor. I can therefore claim a knowledge and appreciation of that establishment's excellence of training, which has been gathered, so to speak, from both ends of the speaking tube, and without which I would not have the temerity to write.

The suggestion in the Government's White Paper on air transport is that the monopoly companies should provide their own training organisation, and I most emphatically disagree. Is the suggestion made because the output of fully trained pilots and air crews from such an organisation as Air Service Training has hitherto proved unsatisfactory? Ask B.O.A.C. who, in their Imperial and British Airways forms, used to absorb the majority of A.S.T.'s pupils. Ask also the many very senior captains of B.O.A.C. who have done courses at Hamble, and whose excellence has never and could not be questioned. Why, then, this thusness? As it patently cannot be the inadequacy of the existing organisation with its years of specialised experience in turning out the type of air crew personnel required, is it just a sop to those who would be pleased to see yet one more example of successful private enterprise squeezed out, or is it sheer ignorance of the facilities so readily available?

We had at Hamble at the outbreak of the war one of the finest and most comprehensive aeronautical training schools in the world, staffed by the most competent collection of instructors it has been my privilege to meet. What has been done can be done again, but a *status quo* attitude was never one of A.S.T.'s failings, and I know that that organisation has been immensely strengthened by the general expansion of outlook and experience given by this war, and by the most up-to-date conception of airline operators' requirements in such matters as assisted approach, flying and airfield control and astro-navigation.

I find it reasonable to suppose that the cost of the Government's proposed training establishment will have to be borne wholly by the public purse, but there surely can be no justification for this. I am convinced that there are plenty of suitable trainees who are not only willing but will expect to pay for their training, knowing that comparatively satisfactory rates of pay can be earned immediately their training is completed. It may be necessary and desirable to enlist the Government's help through the Civil Air Ministry in the obtaining of suitable aircraft and equipment, but pupils should not expect the cost of their training to be borne wholly by public funds.

Let the monopoly airlines by all means, and at all times, state their requirements, but let them concentrate their energies and the taxpayers' money on producing an Empire airline worthy of the name, and leave the training to the experts.

L. B. GREENSTED
(Chief Test Pilot, Rotol, Ltd.).

DANGERS IN TURNING

Academic Knowledge at Fault

YOUR contributor Sqn. Ldr. A. Sipowicz in *Flight*, April 26th, has the gift of lucidity to an unusual degree, especially when it is remembered that he is expressing himself in a foreign language.

It seems to me, however, that his understanding of the principles of flying is more academnic than practical. The "dangers facing a pilot during a turn" are explained to a pupil very fully in any good training school, and there should be no excuse for ignorance of such an important subject.

Your contributor states at the outset, that . . . "All accidents following badly performed turns, are caused by an inadvertent stalling of the aircraft, with a subsequent spin." I submit that this is a very sweeping statement and, like most sweeping statements, is not substantiated upon investigation. Many of such accidents are the result of simply inaccurate control, for which there is no room at low altitude, with no question of stalling.

When treating with the relationship between airspeed and angle of incidence, he says: " . . . the greater the angle of incidence, the lower the airspeed." This is surely meant to be 'tother way round, i.e., "the lower the airspeed the greater the angle of incidence."

Without dabbling in mathematics, I next disagree with his equation which is based upon the assumption that the increase of weight of an aircraft in a turn depends upon the angle of bank. And as to the load increasing "nine times its normal value at 83 degrees bank" (as shown in his graph), this is absurd. For gentle to medium banked turns the angle of bank may govern the load-increase, but in steep turns the governing factor is the *acceleration in the pitching plane*, or tightness of the turn. This varies with the airspeed for a given radius of turn.

For example, take a 180-degree turn at 200 m.p.h. and another at 300 m.p.h., both at say 70 degrees bank, and rate 3. The 200 m.p.h. turn will have a radius of perhaps half a mile, whilst the 300 m.p.h. turn will have a radius of probably a mile. The load-increase will be much the same in each case. If, however, we try to make the 300 m.p.h. turn in the same small radius as the 200 m.p.h. turn, the loading will go up enormously, and probably result in a high-speed stall.

In short, the increased loading in a steep turn is not governed by the angle of bank. But the pinnacle of misstatement is reached in the remarkable sentence: " . . . warning the pilot of the approach to stalling by the sloppiness of the stick." Far from being sloppy, considerable force must be exerted on the stick to produce a high-speed stall, and the avoidance of using such force is the pilot's natural safeguard.

R. H. HENDERSON.

R.A.F. Liberators above the clouds in Burma, on the way to attack Japanese stores in Rangoon.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Appointments

THE Air Ministry announces the following appointments:—

Air Commodore PERCY RONALD GARDNER, EARL OF BANDON, D.S.O., Air Officer Commanding a Group in Eastern Air Command, South East Asia, to be Acting Air Vice-Marshal.

Air Commodore GERALD ERNEST GIBBS, C.B.E., M.C., to be Air Officer Commanding a Group in Air Command, South East Asia, with the acting rank of Air Vice-Marshal.

Air Vice-Marshal HENRY KARSLAKE THOROLD, C.B.E., D.S.O., D.F.C., A.F.C., to be Head of the Air Section of No. 30 Mission, Moscow.

Air Commodore HAROLD JACE ROACH, C.B.E. A.F.C., Senior Equipment Staff Officer, Headquarters Bomber Command, to be Acting Air Vice-Marshal.

Air Vice-Marshal the EARL OF BANDON has been serving in India and South East Asia since 1942 on bomber and fighter operations duties and as Liaison Officer with the U.S. Army Air Force. From July, 1944, he has been in command of a Group in Eastern Air Command, S.E.A. He was awarded the D.S.O. in 1940 and has been mentioned three times in dispatches.

Air Vice-Marshal G. E. GIBBS went to the Headquarters of 3rd T.A.F. Air Command, South East Asia, as Senior Air Staff Officer at the end of 1943 and in the following year served in the same capacity at R.A.F. Headquarters, Bengal (Burma).

Air Vice-Marshal THOROLD served at the R.A.F. Headquarters in France in 1940. He then went out to West Africa, returning in 1942. For the past two years he has been at the Headquarters of a bomber group.

Air Vice-Marshal ROACH, who has specialised in engineering since 1925, spent the first two war years in the Far East in command of a depot coming to Britain in 1941 to Maintenance Command Headquarters, from which he was posted to Headquarters of a Maintenance Group as Senior Maintenance Staff Officer. After taking a long engineering course in 1925, he went to H.Q. Iraq on engineering duties. He was then engaged on engineering staff duties at H.Q. No. 10 Group in 1930, and in 1935 went to the School of Naval Co-operation on flying duties. In 1937 he went to the Far East on engineering duties.

Air Marshal G. O. Johnson, C.B., M.C., who has succeeded Air Marshal Breadner as A.O.C.-in-C., R.C.A.F. Overseas.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Service Order

Major N. F. HARRISON, S.A.A.F., No. 229 Sqn.—This officer has a most impressive operational record. In the early part of his service he took part in operations in connection with the Abyssinian Campaign. Afterwards Major Harrison participated in many sorties against targets in North Africa, Sicily, Italy, Albania and Yugoslavia. On his second tour of operational duty, Major Harrison completed a large number of varied sorties during which he led his squadron in harassing attacks on the enemy's lines of communication, V-weapon sites in the Pas de Calais area and other enemy targets. Throughout these operations much loss has been inflicted on the enemy. Much of the success achieved can be attributed to this officer's splendid leadership, great skill and determination. His devotion to duty has been of the highest order.

F/O. J. CHURCHILL, D.F.C., R.A.F.V.R., No. 357 Sqn.—This officer has completed a large number of sorties, involving long flights. He has consistently displayed the highest standard of devotion to duty and his example has been most impressive. In January, 1945, F/O. Churchill was the pilot and captain in an aircraft detailed for a sortie. The operation called for a high degree of skill and resolution. That success was achieved on a flight covering thousands of miles in all is a fine tribute to this officer's superb airmanship, great captaincy and iron determination.

Act. Sqn. Ldr. W. G. WISHART, D.F.C., R.A.F.V.R., No. 97 Sqn.—This officer has now participated in a very large number of sorties, including eleven attacks against Berlin and others against strongly defended targets in the Ruhr area; Sqn. Ldr. Wishart has also flown with distinction against such far distant targets as Peenemunde, Danzig and Gdynia. He has at all times displayed a high degree of skill, courage and determination, setting an example which has impressed all. In January, 1945, Sqn. Ldr. Wishart took part in an attack against the Dortmund-Ems Canal, and his outstanding ability as navigator contributed materially to the success obtained.

Act. Wing Cdr. D. G. HAYWARD, R.A.F., 148

SERVICE AVIATION

Sqn.—This officer is now on his third tour of operational duty. He has displayed a high degree of skill and courage and throughout a long operational career his devotion to duty has been unfailing. Within the past year, Wing Cdr. Hayward has participated in attacks against a wide range of targets in the Balkans, Italy, Austria and Southern Germany. This officer has displayed the greatest keenness and his example has won the highest praise.

Act. Wing Cdr. J. D. SOMERVILLE, D.F.C., R.C.A.F., No. 409 (R.C.A.F.) Sqn.—This officer has displayed outstanding efficiency, great courage and determination, qualities which have been well reflected in the fine fighting spirit of the squadron he commands. He has completed very many sorties and has destroyed seven enemy aircraft at night. He has set a fine example of loyal and devoted service.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. G. WONNACOTT, D.F.C., R.C.A.F., 414 (R.C.A.F.) Sqn.—This officer continues to show great gallantry in air operations. His keenness to engage the enemy was well in evidence on one occasion in January, 1945, when, on returning to base at the completion of a reconnaissance, he saw the airfield was being attacked by a large force of enemy aircraft. Sqn. Ldr. Wonnacott immediately engaged the enemy. Before all his ammunition was expended, this resolute pilot had destroyed three of the attacking force. This officer has displayed devotion to duty of a very high order.

Flt. Lt. R. J. FOSTER, D.F.C., R.A.F.V.R., and Flt. Lt. M. F. NEWTON, D.F.C., R.A.F.V.R., both of 604 Sqn.

As pilot and observer respectively, Flt. Lts. Foster and Newton have completed a very large number of sorties. They have set a fine example of courage and determination and have destroyed eight enemy aircraft, successes which are an excellent testimony to their great skill and co-operation. Flt. Lt. Newton has shared in the destruction of one more enemy aircraft, which was shot down when he was flying with another pilot.

Act. Wing Cdr. D. M. WALBOURN, D.S.O., D.F.C., R.A.F.V.R., 17 Sqn.—In December, 1944, Wing Cdr. Walbourn piloted an aircraft in an attack on the railway sidings at Coblenz. On the outward journey the starboard engine began to vibrate badly and had to be put out of action. Despite the loss of engine power, Wing Cdr. Walbourn continued to the target, which he reached on time. Whilst over the target much anti-aircraft fire was directed at his aircraft. Nevertheless, Wing Cdr. Walbourn executed a straight and level bombing run. The aircraft was hit many times in the fuselage and mainplane, but this pilot flew back to base. The success achieved reflects the greatest credit on the skill and determination of this officer.

Flt. Lt. A. R. MOORE, D.F.C., R.A.F.V.R., No. 56 Sqn.—Since the award of the Distinguished Flying Cross, this officer has participated in a large number of operational sorties. He has led his flight with outstanding ability, courage and resolution. Flt. Lt. Moore has destroyed at least three enemy aircraft and inflicted much damage on enemy fighting vehicles, mechanical transport and lines of communication.

Distinguished Flying Cross

Wing Cdr. W. J. H. TUCKER, R.A.F.V.R., No. 18 Sqn.
Act. Sqn. Ldr. W. R. ASSHETON, R.A.F.O., No. 540 Sqn.
Act. Sqn. Ldr. J. I. PENGELLY, R.A.F.V.R., No. 605 Sqn.
Flt. Lt. A. S. BAKER, R.A.F.V.R.
Flt. Lt. A. W. BOWER, R.A.F.V.R., No. 33 Sqn.
Flt. Lt. A. J. EVANS, R.A.F.V.R., No. 502 Sqn.
Flt. Lt. C. H. L. FOSTER, R.A.F.V.R., No. 464 (R.A.A.F.) Sqn.
Flt. Lt. F. E. G. MELENEE, R.A.F.V.R., No. 1220 Sqn.
Flt. Lt. F. M. READE, R.A.F.V.R., No. 613 Sqn.
Flt. Lt. F. H. SILK, R.A.F.V.R., No. 4 Sqn.
Flt. Lt. G. W. TOPLISS, R.A.F., No. 613 Sqn.
Flt. Lt. R. G. WEST, R.A.F., No. 2 Sqn. (2/Lt. R.A.).

The badges of (left) No. 271 Squadron, R.A.F. "Death and Life." (Centre) No. 95 Squadron, R.A.F. "Trans Mare Exivi" (I Went Out Over the Sea). (Right) No. 294 Squadron, R.A.F. "Vita Ex Undis Abrepta" (Life Snatched from the Waves.)

Act. Flt. Lt. S. C. P. GODFREY, R.A.F.V.R., No. 156 Sqn. (since deceased).
Act. Flt. Lt. C. B. T. MCSWEENEY, R.A.F.V.R., No. 156 Sqn. (since deceased).
Act. Flt. Lt. H. P. WOODWARD, R.A.F., No. 464 (R.A.A.F.) Sqn.
Flt. Lt. C. LEAGH-MURRAY, R.A.A.F., No. 16 Sqn.
Flt. Lt. R. M. MACKENZIE, M.B.E., R.A.A.F., No. 168 Sqn.
F/O. R. E. MACKIE, R.A.A.F., No. 541 Sqn.
Lt. G. D. SILVA, S.A.A.F., No. 33 Sqn.
Flt. Lt. R. H. FOSTER, R.N.Z.A.F., No. 544 Sqn.
F/O. C. L. M. FORSYTH, D.F.M., R.N.Z.A.F., No. 98 Sqn.
Lt. (A) L. J. RAPSON, R.N.Z.N.V.R., No. 819 Naval Air Sqn.
Flt. Lt. J. BENDIXSEN, R.C.A.F., No. 541 Sqn.
Flt. Lt. M. J. GORDON, No. 421 (R.C.A.F.) Sqn.
Flt. Lt. D. I. HALL, R.C.A.F., No 414 (R.C.A.F.) Sqn.
Act. Flt. Lt. J. CARR, R.C.A.F., No. 439 (R.C.A.F.) Sqn.
F/O. C. C. HAZLETT, R.C.A.F., No. 422 Sqn.
F/O. F. C. LANSDALL, R.C.A.F., No. 407 (R.C.A.F.) Sqn.
F/O. J. W. D. PUDNEY, No. 98 Sqn.
F/O. R. W. TULLY, R.C.A.F. (now P/O.), No. 35 Sqn.
F/O. H. J. HEWETSON, R.C.A.F., No. 625 Sqn.
F/O. J. HOPE, R.C.A.F. No. 431 (R.C.A.F.) Sqn.
F/O. H. J. HUMBER, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. F. E. MCG. JEFFERY, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. T. J. KELLY, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
F/O. D. MACR. KENNEDY, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
F/O. A. J. E. LAFLAMME, R.C.A.F. No. 153 Sqn.
F/O. J. L. LANGLOIS, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. C. B. LEE, R.C.A.F., No 429 (R.C.A.F.) Sqn.
F/O. J. R. LIGHTBOWN, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
F/O. G. M. MAHONEY, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. E. C. MAYO, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. G. F. MCGLONE, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
F/O. D. B. O. MCKINNON, R.C.A.F., No. 404 (R.C.A.F.) Sqn.
F/O. J. H. MCQUISTON, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
F/O. J. M. MILLS, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. C. E. N. MONTY, R.C.A.F., No. 437 (R.C.A.F.) Sqn.
F/O. G. W. MOORE, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
F/O. J. M. MURRAY, R.C.A.F., No. 77 Sqn.
F/O. T. J. NAIRN, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. G. PAPPAS, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
F/O. J. E. M. PEACOCK, R.C.A.F., No. 12 Sqn.
F/O. F. C. PEARSON, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
F/O. H. M. PRINGLE, R.C.A.F., No. 35 Sqn
F/O. R. A. RUSSELL, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
F/O. W. P. SAYE, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. E. K. SEIGEL, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
F/O. R. H. SHEARER, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. W. J. SHIELDS, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
F/O. W. H. SHOTTON, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
F/O. J. W. SIMPSON, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. P. SLIPEC, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. B. D. SMITH, R.C.A.F., No. 77 Sqn.
F/O. A. STADNYK, R.C.A.F., No. 77 Sqn.
F/O. J. V. VANTIGHEM, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. W. WORSTER, R.C.A.F., No. 115 Sqn.
Act. F/O. T. J. BEEBY, R.C.A.F., No. 10 Sqn.
Act. F/O. W. W. BRIGGS, R.C.A.F., No. 77 Sqn.
Act. F/O. J. A. D. GRAY, R.C.A.F. No. 101 Sqn.
Act. F/O. A. H. HARRISON, R.C.A.F., No 227 Sqn.
Act. F/O. A. HORNE, R.C.A.F., No. 10 Sqn.
Act. F/O. D. E. MACLEAN, R.C.A.F., No. 90 Sqn
Act. F/O. E. H. NIELSEN, R.C.A.F., No. 101 Sqn.
Act. F/O. S. J. SISSON, R.C.A.F., No. 166 Sqn
Act. F/O. G. A. WARK, R.C.A.F., No. 514 Sqn.
P/O. N. T. ADAMS, R.C.A.F., No. 35 Sqn.
P/O. W. C. ATKINSON, R.C.A.F., No. 158 Sqn.
P/O. R. G. BEARE, R.C.A.F., No. 78 Sqn.
P/O. P. D. BLUETHNER, R.C.A.F., No 405 (R.C.A.F.) Sqn.

Distinguished Flying Medal

Flt. Sgt (later P/O.) G. E ANDREWS, No. 57 Sqn. (since deceased).
Flt. Sgt. J. CURRY, R.A.F.V.R., No. 97 Sqn (since deceased).
Flt. Sgt. H. P. DWYER, No. 57 Sqn (since deceased).
Flt Sgt. A. V. FORSYTH, R.A.F.V.R., No. 35 Sqn. (since deceased).
Flt. Sgt. F. G. METCALFE (later P/O.), R.A.F.V.R., No. 619 Sqn. (since deceased)
Flt. Sgt. E. MILLING, R.A.F.V.R., No. 103 Sqn (since deceased).
Flt. Sgt. K. H. MUDE, R.A.F.V.R., No. 502 Sqn.
Flt. Sgt. T. M. TWOMEY, R.A.F.V.R., No. 97 Sqn (since deceased).
Act. Flt. Sgt. (later P/O.) R. M HOGG, R.A.F.V.R., No 97 Sqn. (since deceased).
Act. Flt. Sgt. J. T. SULLIVAN, R.A.F.V.R., No 97 Sqn (since deceased).
Flt. Sgt. (now P/O.) B. L. MCKINNON, R.C.A.F. No. 419 (R.C.A.F.) Sqn.
Flt. Sgt. R. G. CHRISTIE (now P/O.), No. 97 Sqn
Act. Flt. Sgt. J. KANELAKOS, R.C.A.F. (now F/O.), No. 7 Sqn.
Flt. Sgt. D. G. KINGSLAND R.A.F.V.R., No. 214 Sqn.

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished service:—

Military Cross

Lt. C. W. E. BLAKE, S.A.A.F., No. 24 (S.A.A.F.) Sqn.

Military Medal

Flt. Sgt. C. A. TARDIF, R.A.F., No. 683 Sqn.
Cpl. J. GEWELBER, R.A.F.V.R., No. 33 Sqn.
Sgt. G. D. TOYE, R.A.F.V.R., R.A.F. Regt.—In January, 1945, Sgt. Toye was in command of a detachment which had been withdrawn from action for airfield patrol duties. Sgt. Toye's gun had been left in a position ready for action. At about 09.25 hours another airman, who was on sentry duty, warned Sgt. Toye of the approach of between 30 and 50 enemy aircraft. Sgt. Toye immediately ordered his men to "take post," and in spite of the automatic loader being filled with A.P. ammunition, got the gun into action with such speed that he was able to engage the first of six Me 109s which came in to attack a nearby dispersal ground. Immediately afterwards four FW 190s and two Me 109s attacked Sgt. Toye's gun post. Sgt. Toye continued to instruct his men and engaged the attackers as they dived low to

The badges of (left), No. 126 Squadron, R.A.F. "Foremost in Attack." (Centre) Royal Australian Air Force Overseas, "Per Ardua ad Fortunam" (Upwards through Effort to Fortune.) (Right) No. 275 Squadron, R.A.F. "Non Interibunt" (They Shall not Perish.)

SERVICE AVIATION

attack, one after another in rapid succession. The deliberate attack against the gun post was temporarily abandoned. Sgt. Toye then engaged a Me 109 which was coming in to attack aircraft on the ground; a hit was obtained and the enemy aircraft was observed to go down emitting black smoke. A further two FW 190s then came in to attack the gun post. Sgt. Toye remained unperturbed and engaged the aircraft as they came in to attack almost simultaneously from different angles. One of the attackers was hit and set on fire. This was the first occasion on which the detachment had been under enemy fire. Sgt. Toye's outstanding courage, initiative and leadership inspired his comrades and contributed largely to the success achieved.

Roll of Honour

Casualty Communiqué No. 501.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 197 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. K. Angus; Sgt. E. G. Baker; Sgt. L. J. Bull; P/O. L. A. V. Burrows; Flt. Sgt. G. F. Callon; Flt. Sgt. C. G. Campbell; Sgt. H. Cook; Sgt. D. A. Cox; F/O. D. Fletcher; Sgt. R. Gill; Sgt. A. D. Harding; P/O. G. B. Jones; Flt. Sgt. F. E. Mingay; Sgt. J. Norris; F/O. S. E. Perrin; Flt. Lt. W. F. W. Porteous, D.S.O., D.F.M.; F/O. J. Quinn.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. A. J. McD. Barr; F/O. R. J. Debenham; Flt. Sgt. R. D. Frame; Sgt. J. F. Garnett; Sgt. T. H. B. Griffiths; Flt. Sgt. R. S. D. Hatswell; Sgt. P. G. W. Hendon; Flt. Sgt. A. L. Hewitt; Sgt. R. D. Hewlett; Sgt. M. J. Hicks; Sgt. J. W. Hoyle; Flt. Sgt. M. Kerr; W/O. L. W. Marshall; Sqn. Ldr. I. A. Morrin; F/O. J. Richy; Flt. Lt. D. C. Ross; Sgt. G. W. Whittles; Sgt. P. C. Wilson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. C. Dale; Sgt. F. G. Aldred; F/O. L. R. Allen; Sgt. R. K. Barlow; Sgt. J. Belton; F/O. F. J. Blute, D.F.M.; Sgt. H. Boardley; Sgt. J. Boland; Sgt. J. N. Boston; Flt. Sgt. J. R. Bradshaw; Flt. Sgt. J. S. Brand; Sgt. A. Bretiell; Sgt. K. H. Brittle; W/O. A. E. Broomfield; Sgt. A. H. Campbell; Sgt. E. G. Cane; Flt. Sgt. R. D. Casajuana; Flt. Sgt. E. G. Cass; P/O. A. Ghaulk; W/O. L. Christie; Sgt. K. E. Clark; Flt. Sgt. R. C. Clark; Sgt. D. N. Collins; Sgt. D. J. Coombe; Sgt. P. G. Copping; Wing Cdr. A. G. S. Cousens, D.S.O., D.F.C.; Flt. Sgt. H. H. Craig; Sgt. J. R. Craig; Flt. Sgt. R. H. Crystal; Sgt. Y. Demeillac; Flt. Lt. P. F. Denny; Flt. Lt. L. Ehrman, D.F.C.; Flt. Sgt. T. L. Evans; Sqn. Ldr. C. J. Farmery, D.F.C.; Sgt. F. W. Flower; Sgt. K. Frank; Sgt. D. J. Gilham; P/O. G. C. Gunzi; W/O. J. R. Hanson; Sgt. T. Hardman; Sgt. A. S. Harman; P/O. E. C. B. Harper; Sgt. J. A. Haylock; Sgt. W. Heaher; Sgt. H. Hill; Flt. Sgt. R. Holmes; W/O. D. J. Hughes; Sgt. F. Hughes; Sgt. G. Ibbotson; Sgt. R. C. J. Iles; Sgt. R. Johnson; Flt. Sgt. S. Jones; Sgt. W. Lee; F/O. F. V. Legon; Flt. Sgt. N. Livingstone, D.F.M.; Sgt. S. R. Loades; F/O. J. Lockhart; Sgt. D. A. Loveday; Sgt. K. A. Lowery; Sqn. Ldr. D. W. Mansbridge, A.F.C.; Sgt. J. J. Melling; Flt. Sgt. A. M. Miller; Sgt. J. G. Morris; Sgt. D. Minor; Flt. Sgt. N. Montgomery; Sgt. P. Neil; Sgt. H. H. Newburn; Sgt. A. G. Palmer; W/O. A. S. Palmer; F/O. J. B. G. Pezaro; F/O. W. Preston, D.F.C.; P/O. A. L. Prince; F/O. H. B. D. Pringle; Sgt. N. Pyke; Sgt. G. W. Rawlings; Flt. Sgt. J. T. Read; Sgt. S. R. Reeve; Sgt. D. C. Rhodes; P/O. F. W. Richards; Sgt. H. Roberts; Flt. Sgt. K. J. Roberts; Sgt. A. Rogerson; Wing Cdr. J. D. Rollinson, D.F.C.; Flt. Sgt. A. Rooks; Flt. Sgt. R. J. Rouse; Flt. Lt. W. W. Ryder; Flt. Lt. R. V. Sanders; Flt. Sgt. L. Sawle; Flt. Sgt. S. W. Sayce; W/O. J. R. Senior; Flt. Lt. R. N. Shard; Sgt. G. A. Shield; F/O. L. J. Slatter; Sgt. J. Smith; F/O. K. F. Smith; Sgt. K. C. Southward; Sgt. W. Speakman; Sgt. D. E. Spencer; Sgt. L. S. Suddick; F/O. G. H. Sudds; Sgt. E. B. Taylor; Flt. Lt. D. L. C. Thomas, D.F.C.; Sgt. L. Timmins; F/O. G. C. Tincler; P/O. F. G. G. Tinn; Sgt. C. R. L. Todd; F/O. M. J. R. Thom; Sgt. T. S. Trinder; Flt. Sgt. P. W. Upton; Flt. Sgt. S. W. Wait; Sgt. C. Walker; Sgt. M. F. R. Walters; Sgt. N. Walton; Sgt. T. Warden; Flt. Sgt. S. B. Wheatley; W/O. W. C. White; Flt. Lt. F. A. Whitehead; Sgt. H. Wild; F/O. R. H. Wilkinson; Sgt. T. S. Wilkinson; Sgt. R. Williams; Sgt. H. Wilson; Sgt. F. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—F/O. W. P. Brittain.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. W. S. Gaunt, D.F.C.; Sgt. I. M. Quaife.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. C. A. Joseph; F/O. A. Scott; Flt. Lt. A. W. Thompson.

MISSING.—P/O. E. M. Boorman; Sgt. M. Brennan; Flt. Sgt. E. O. Bule; Sgt. J. Carver; Flt. Lt. G. N. Chandler; Sgt. P. A. Christie; Sgt. V. J. Clark; Sgt. W. G. Glassen; Flt. Sgt. W. L. Cleary; Sgt. L. J. Cooke; Flt. Sgt. A. D. Cozens; Flt. Sgt. F. Crompton; Flt. Sgt. J. E. Davies; Sgt. A. Dawson; F/O. C. J. Daynton; Sgt. E. Deller; Sgt. E. A. Freeman; Flt. Sgt. R. A. Freeman; Flt. Sgt. W. L. Frost; F/O. K. Gibbs, D.F.C.; Sgt. J. S. Gray; F/O. O. Griffiths; Flt. Sgt. J. S. Hoskins; Flt. Sgt. C. H. R. James; Sgt. A. J. Johns; Sgt. R. O. Jones; Flt. Sgt. W. Kelly; Sgt. J. Kennedy; Sgt. R. King; Flt. Sgt. A. Lee; Flt. Lt. J. F. Lown; Flt. Sgt. E. McQuire; Flt. Sgt. W. McRae; Sgt. J. L. Morgan; Sgt. P. Morgan; Sgt. D. Morris; Sgt. K. A. W. Ottewell; Sgt. G. E. Patterson; W/O. A. Ramsay; Sgt. J. D. Richmond; Flt. Sgt. L. C. Roche; F/O. H. Ross; Sgt. H. Sansome; Sgt. J. G. Shepherd; W/O. T. R. W. Smith; Sgt. R. C. Soanes; Flt. Sgt. A. D. Steeden; Flt. Sgt. G. R. Traylen; W/O. M. J. E. Tyler; Flt. Sgt. W. Walker; Sgt. W. N. Watson; Sgt. V. Welbourne; Flt. Sgt. F. J. Wholey; F/O. R. W. Woodrow.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. J. B. Cuthbertson; Flt. Sgt. W. F. Pywell.

KILLED ON ACTIVE SERVICE.—A/C.2 J. F. Bartholomew; A/C.2 P. Cain; Flt. Sgt. T. J. Davies; W/O. C. G. Dear; A/C.2 C. M. Field; Flt. Sgt. P. P. Funnell; A/C.2 B. C. Hay; Flt. Lt. W. S. Jarvis; Flt. Sgt. C. K. Johns; Wing Cdr. E. J. M. Lang; Flt. Sgt. J. N. McKenna; Sgt. R. B. Price; L.A/C. C. H. Rumble; Flt. Lt. P. G. Sargent; Sgt. I. P. H. Smith; Sgt. I. F. Turner; Sgt. J. A. Wenham.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. M. Broadhurst; Flt. Sgt. R. Herbert; Flt. Lt. R. I. Johnson; Flt. Sgt. H. Turner; P/O. R. J. West.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. D. P. Barrett; P/O. N. Brockhouse; Sgt. W. Clark; Sgt. F. Conroy; Sgt. A. Crook; L.A/C. F. W. Guest; Sgt. W. Harrison; Sgt. C. A. Howson; Sgt. E. J. Hurr; Sgt. C. A. James; F/O. D. Jefferies; Flt. Sgt. J. D. Lewis; Sgt. R. Macbeth; F/O. F. Miller; Sgt. J. Morgan; F/O. A. B. Parr; Flt. Lt. W. J. Pershke; Flt. Sgt. W. H. Rumney; Sgt. B. H. Smith.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Sgt. L. Backhouse.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. A. Chester; Cpl. V. W. Mathers; Flt. Lt. R. Wilson.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Cpl. C. A. Rabbitt; L.A/C. C. B. Vessey.

DIED ON ACTIVE SERVICE.—Cpl. J. D. H. Murray; L.A/C. K. MacL. Paterson; A/C.1 A. Stuart.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. S. R. Ashton; Flt. Sgt. G. A. Berry; F/O. R. B. Daniel; Flt. Sgt. C. Farley; W/O. J. E. Fisher; Sgt. G. G. P. Hine; Flt. Sgt. J. J. McClurg; Sgt. J. Pettit; Sgt. R. L. Scott; F/O. A. A. Smailes; Sgt. J. C. Watkins; Flt. Sgt. E. H. Wells; Flt. Sgt. H. Williams

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/C.W.2 I. Roydhouse.

Royal Australian Air Force

KILLED IN ACTION.—P/O. M. W. Rohrlach.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. A. M. Duggleby; P/O. H. Gray; P/O. M. R. Hunter.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. G. P. Pinn; F/O. J. S. Wright.

MISSING.—Flt. Sgt. S. A. Brown; Flt. Sgt. C. L. Fincham; Flt. Lt. J. Milne; F/O. M. L. Perez; Flt. Sgt. J. F. Prince; W/O. W. A. Simpson; Flt. Sgt. J. L. Stagg; Flt. Sgt. C. F. Walters.

KILLED ON ACTIVE SERVICE.—F/O. J. L. Rackham; F/O. B. J. W. Thomson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. B. S. Meyer.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. G. N. Marchant.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. R. H. Jones; Flt. Sgt. G. Warren.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. D. C. Gordon; F/O. J. Smith.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Lt. P. Wilson.

MISSING.—F/O. J. R. Beasley; W/O. C. R. Bradley; W/O. I. C. Bradley; F/O. C. M. Buell; F/O. L. J. G. Catheralle; P/O. A. B. Clark; Flt. Sgt. B. V. Cobbett; F/O. J. P. L. Cullen; F/O. B. E. Drewery; F/O. R. H. Emerson; P/O. W. A. Flett; F/O. G. Floyd; Flt. Sgt. J. R. Giblin; Flt. Sgt. K. E. Kelly; W/O. M. A. Krewenchuk; P/O. A. R. McDonald; Flt. Sgt. J. B. McGregor; Flt. Sgt. K. M. Mason; Flt. Sgt. O. F. Newton; Flt. Lt. W. K. Parke; Flt. Sgt. J. J. S. R. Smith; F/O. D. Woolf.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. F. C. Bower.

KILLED ON ACTIVE SERVICE.—P/O. V. H. Coyne; P/O. B. G. Kinsman; F/O. T. W. Leahy.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. W. P. Golden.

DIED ON ACTIVE SERVICE.—Flt. Lt. G. D. Robinson, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. A. W. Brickenden; Flt. Lt. J. W. Ross.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Lt. J. A. C. Fowler.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. L. J. S. Fittock.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. S. Bergin; P/O. F. S. Blackwell; P/O. C. F. Farquharson; Flt. Sgt. A. J. Hannah; Flt. Lt. H. G. Hicks; F/O. A. R. Oates.

MISSING.—P/O. R. J. Aitchison; Wing Cdr. R. J. Newton.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. G.

ERRANDS OF MERCY: Liberated French and Belgian prisoners being evacuated from Germany by air. They were flown by Dakotas to Brussels and dispersed from there.

Bolger; Flt. Sgt. K. D. Howden; Flt. Sgt. D. W. McLennan; Flt. Sgt. M. Reece.

South African Air Force

MISSING.—2nd Lt. D. John; W/O. A. A. Jordan; W/O. J. W. Thompson; Lt. P. R. Van Rensburg.

Casualty Communiqué No. 502

Of the names in this list, 200 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sqn. Ldr. A. M. L. Alderton; P/O. J. Bray; Flt. Sgt. D. Crome; Sgt. L. Daniels; Flt. Sgt. D. R. J. Ewer; Sgt. J. W. Higdon; W/O. E. Jones; Sgt. J. Kempson; F/O. R. S. Le Good; Sgt. A. F. MacKay; Flt. Sgt. A. J. Pack; Sgt. I. A. Prestswell; Sgt. R. W. Richardson; W/O. A. E. Saunders; Flt. Sgt. B. T. Smith; P/O. G. J. L. Smith; F/O. A. R. Steeples; Flt. Sgt. N. M. Trimmer; P/O. N. Varley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. J. Adamson; Sgt. W. E. Alexander; Sgt. F. A. Aver; Flt. Sgt. E. E. Baron; Sgt. K. Bartholomew; F/O. A. V. Bectch; Sgt. F. W. Booth; Sgt. R. Booth; Sgt. H. R. Bowles; Flt. Sgt. W. S. Bremner; Sgt. J. W. Brown; Sgt. F. C. W. Bull; Flt. Sgt. G. Carrell, D.F.M.; F/O. R. D. Carter; F/O. J. Clark; P/O. C. Clifton; F/O. A. E. Cook; Sgt. D. O. Cottrell; Sgt. F. H. Doncaster; Sgt. R. Dowzer; Sgt. D. R. Edmands; Flt. Sgt. W. G. Filer; P/O. T. V. Finn; Sgt. T. A. Fox; Flt. Lt. H. L. Fry; Sgt. K. A. Glew; F/O. M. D. L. Graham; Sgt. W. R. Greenaway; Sgt. G. E. Greenwood; Flt. Sgt. L. Hanson; Flt. Lt. K. Harris; P/O. J. D. Harrison; Flt. Sgt. E. Haslam; Flt. Sgt. T. D. Henderson; Flt. Sgt. F. C. Hickling; F/O. R. E. Hicks; Sgt. H. Howson; P/O. F. G. Hursey; Sgt. A. C. Jackson; Sgt. A. Johnston; Flt. Sgt. W. A. Jukes; Sgt. A. T. Keel; Flt. Lt. T. Leithead, D.F.M.; F/O. W. Lester; Sgt. D. G. Lloyd; Flt. Sgt. F. Lovatt; P/O. W. A. Lynch; Sgt. T. F. McLean; F/O. G. I. H. McPherson; F/O. N. Marrian; P/O. B. St. C. H. Moodie; Sgt. G. C. Munton; Sgt. W. Newman; Sgt. P. H. Normanton; Flt. Sgt. A. C. N. Morris; Sgt. R. W. Norris; Sgt. W. H. P. Omnet; Sgt. E. J. C. Porter; Sgt. D. F. Prusher; Flt. Sgt. N. J. Raper; Sgt. J. T. Ravenscroft; Sgt. S. E. Rayner; Sgt. E. C. Richards; Sgt. E. R. Richardson; Flt. Sgt. A. J. Sandford; Sgt. T. D. Simpson; Sgt. H. Stewart; Sgt. L. Stone; Sgt. W. Summers; Sgt. R. C. Thorpe; Flt. Sgt. B. S. Tugwell; Flt. Sgt. R. Underwood, D.F.M.; Sgt. D. T. Vince; P/O. H. A. Wallis; Sgt. L. Walters; Sgt. W. Warburton; Flt. Lt. J. W. Warren, D.F.C.; P/O. V. Waterhouse, D.F.C.; Flt. Lt. K. R. Waugh; P/O. C. A. Weeks; F/O. R. A. West; Sgt. R. Westall; F/O. R. C. Wickens; Sgt. W. Wilson; P/O. J. D. Wyn-Evans.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. R. G. Brown; Flt. Sgt. J. E. K. Courthorne; F/O. P. J. Richards; Flt. Lt. A. D. Wagner, D.F.C.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. R. Leggett.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. P. A. Lake; Flt. Sgt. J. G. O'Neill.

MISSING.—W/O. S. E. Abrams; P/O. W. Bainbridge; Sgt. E. H. M. Barr; Flt. Sgt. J. H. D. Bax; Sgt. J. D. Beardsmore; Flt. Sgt. H. M. Blusston; P/O. W. E. Bransgrove; Sgt. R. A. Bromley; Sgt. A. H. Brown; Flt. Sgt. D. A. Bullock; P/O. S. J. Bunn; Sgt. J. Busk; F/O. W. S. Cameron; Sgt. A. C. Clark; W/O. A. D. Clayton; Sgt. A. T. Clyde; Flt. Sgt. L. D. I. Coates; Sgt. S. Cook; Sgt. P. S. Cotterell; Flt. Sgt. W. A. Daniel; W/O. J. H. Diffley; Flt. Lt. W. M. Douglas; Sgt. J. Dubois; Flt. Sgt. J. A. Dunning; Flt. Sgt. J. W. Emms; Flt. Sgt. R. English; Sgt. R. E. Eratt; Flt. Sgt. R. C. Fayers; Sgt. D. Fell; Sgt. S. J. W. Franklin; Flt. Sgt. N. E. Freshwater; Sgt. J. Gore; Flt. Sgt. A. R. Hall; Flt. Sgt. J. Harding; Sgt. H. Hardwick; Sqn. Ldr. K. G. Hart, D.F.C.; Flt. Sgt. M. E. F. Haslam; Flt. Lt. I. B. Hayes, D.F.C.; Sgt. B. Jackson; Flt. Lt. J. T. Jones; W/O. R. Jones; W/O. A. W. Martin; Flt. Lt. W. A. Moore; Flt. Sgt. L. G. Morgan; Sgt. J. E. Muldowney, D.F.M.; Sgt. C. H. Palmer; F/O. C. Pearton; P/O. D. F. Prior; Sgt. A. R. Pritchard; Flt. Sgt. T. W. Richards; Sgt. S. J. Sanderson; Flt. Sgt. N. S. Scott; Sgt. P. Share; Sgt. W. Shaw; Act. F/O. C. R. Sifton; Flt. Sgt. W. S. Spratt; Flt. Lt. J. N. Steel; P/O. E. G. Stevens; Flt. Sgt. J. C. Tear; Sgt. G. H. Thirkettle; Sgt. E. Timms; Sgt. V. C. Topham; W/O. R. B. Warner; P/O. R. Warwick; Sgt. J. N. Wheldon; Flt. Sgt. J. R. Whitmore; Sgt. G. R. Wilding; Sgt. G. Williams; Flt. Sgt. G. A. Wilson; Sgt. R. V. S. Wilson; F/O. J. Woods; Sgt. J. H. Yearsley.

KILLED ON ACTIVE SERVICE.—F/O. P. R. Armstrong; Sgt. M. F. MacLean; Sgt. L. T. Meadows; Sgt. E. S. Parrett; Sgt. C. Wade; Sgt. J. S. Wright; Sgt. A. Sinclair.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. D. L. Brett; Flt. Sgt. C. L. Johnson; Flt. Lt. N. H. Woodward.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. P. R. Aitken; Sgt. K. J. Cameron; Sgt. D. W. Fussell; Flt. Sgt. F. A. Pearce; Sgt. K. Powell; Sgt. S. H. Seaforth; Sgt. J. W. J. Spiller; Flt. Sgt. P. H. Thomas; Sgt. S. Watkins.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Flt. Sgt. N. F. Harding.

NETTED: A Kingfisher taxying on to the towed net which is caught by a hook under the central float. The net is towed from a boom, and from such a length of cable as to hold the aircraft immediately below the hoisting crane.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 E. R. Hutchinson; L.A/C. A. C. Marshall.

DIED ON ACTIVE SERVICE.—Cpl. C. R. Bate; Flt. Sgt. J. P. Blyth; Cpl. T. H. Chalmers; Sgt. W. E. Clark; L.A/C. R. Coveney; Cpl. W. C. Gibbons; W/O. J. S. Hogg; L.A/C. M. H. Lee; L.A/C. M. B. Scaife; L.A/C. H. L. F. Thompson; L.A/C. J. N. Tremain; Cpl. T. J. Walker.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. F. B. Bamford; Flt. Sgt. F. A. Giles; Flt. Lt. L. W. Harris; W/O. W. H. Hunter; Sgt. R. Lowing; Flt. Lt. K. Stevens.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/C.2 R. Hickson.

Royal Australian Air Force

KILLED IN ACTION.—W/O. C. T. Halpin.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—W/O. D. A. Anderson; W/O. M. T. F. Knox; F/O. L. B. McDermott.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. G. Barrett; Flt. Sgt. J. Bernaldo; Flt. Sgt. K. R. J. Bradbury; Flt. Sgt. R. A. Cook; Flt. Sgt. J. S. Hosier; F/O. B. R. James; P/O. N. J. Lyford; P/O. K. M. MacDonald; F/O. L. Pietsch; F/O. L. W. Robb; Flt. Sgt. J. R. Tree; Flt. Sgt. S. A. Wilson.

WOUNDED OR INJURED IN ACTION.—F/O. M. O. Langham.

MISSING.—P/O. W. E. Burcher; F/O. H. E. D. Figgis; F/O. E. S. Francis; P/O. H. J. Hutcheson; F/O. J. J. Krefter; Flt. Sgt. D. H. Lawrence; W/O. G. R. C. Lowe; W/O. A. W. Lyon; Flt. Sgt. L. G. M. Mannell; F/O. K. R. Nerney; P/O. K. K. Quill; P/O. J. F. Valery; P/O. G. M. Walker.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. L. J. Porter.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. J. N. McLeod.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sqn. Ldr. E. S. Alexander, D.F.C., D.F.M.; P/O. R. E. Allan; P/O. G. H. Armstrong; P/O. R. D. Polson; P/O. A. Carlson; Sgt. L. E. Carey; Flt. Lt. D. A. Claydon; F/O. J. T. Clinkskill; P/O. J. G. Coffin; Flt. Sgt. P. H. Crickmay; F/O. R. C. Crompton; P/O. L. G. Dalgleish; F/O. J. J. Dance; F/O. C. J. Donahue, D.F.M.; F/O. H. W. Fitch; P/O. G. A. Gagnon; F/O. E. S. Guiton; F/O. D. Hackett, D.F.C.; W/O. D. J. Haug; R/O. E. S. Hawkes; F/O. R. H. Head; P/O. D. L. Huband; F/O. D. R. Hunter; P/O. R. E. Johnstone; W/O. A. K. Lawrence; P/O. C. T. E. Lee; Flt. Lt. L. N. McCaig, D.F.C.; Sgt. H. S. McCartney; Flt. Sgt. P. J. Maher; P/O. W. K. Maxwell; F/O. G. F. Nixon; F/O. L. W. O'Neill; P/O. R. J. Orr; F/O. S. W. W. Perry; Flt. Sgt. W. A. Peterson; Sgt. E. S. Pridham; Sgt. B. C. Prill; Flt. Sgt. C. D. Redgrave; Flt. Sgt. H. S. Reid; Flt. Sgt. D. L. Rose Sgt. F. G. Sanderson; F/O. G. E. Sharpe; W/O. H. W. Shaver; W/O. R. H. Stanley; W/O. J. Sutherland; P/O. F. R. Symons; W/O. W. C. Thom; Flt. Sgt. W. B. Tobin; F/O. G. S. Walker; P/O. C. Weaver, D.F.C., D.F.M.; Flt. Sgt. R. E. Williams; P/O. R. P. Wilson.

MISSING, BELIEVED KILLED IN ACTION.—F/O. A. G. Borland.

MISSING.—P/O. R. F. Adam; W/O. S. A. Church; Flt. Sgt. R. C. Conley; W/O. F. S. Dennis; Sgt. J. Feldman; Flt. Lt. D. E. Jenvey; F/O. R. A. McVicar; Flt. Sgt. T. J. Maloney; Flt. Sgt. W. G. E. Morgan; Flt. Sgt. J. C. Rhind; W/O. R. G. Rogers; Flt. Lt. E. B. Sheehy; F/O. V. A. Sorrenti; F/O. A. J. Stringer; Flt. Sgt. H. C. Tarzwell; W/O. L. P. Wakely.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. D. R. K. Nussey.

KILLED ON ACTIVE SERVICE.—F/O. B. Shylega.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—W/O. L. N. Fresque.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. D. B. Anderson.

DIED ON ACTIVE SERVICE.—Cpl. J. E. A. Hebert.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. P. E. Fillion; P/O. D. N. Thompson.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—W/O. H. A. Johansson.

MISSING.—W/O. R. J. Frizzell; Flt. Lt. J. A. Hendry; Flt. Lt. V. Weatherley.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—P/O. I. D. McLeod.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. S. M. McGregor.

South African Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Lt. W. E. Foster; Capt. J. D. N. Harding.

MISSING.—Lt. L. E. Boughey; Capt. R. V. F. Heiden.

Casualty Communiqué No. 503

Of the names in this list 181 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. G. F. Conry-Candler; F/O. K. C. Darke; F/O. W. Davidson; F/O. R. D. Dunlop; W/O. W. P. Edwards; Sgt. J. F. Elson; Sgt. J. T. Frampton; Flt. Lt. P. J. Garland; Sgt. J. G. Hammond; Sgt. G. Hargreaves; Flt. Sgt. A. Hobson; Sgt. D. A. Holloway; Flt. Sgt. F. Jones; Sgt. L. D. Knapman; Sgt. G. E. W. Redmile; Flt. Sgt. P. H. Rodwell; F/O. G. L. Russell; F/O. J. N. Scott; W/O. W. F. Tollworthy.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. D. Booth; Sgt. R. A. Crawford; Sgt. W. J. McCarroll; Flt. Sgt. A. Norton; Sgt. J. Thomson; Sgt. N. V. Ward; Sgt. M. J. Webber; W/O. L. E. Williams.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. H. Adams; Sgt. S. Allan; F/O. F. Allison; F/O. E. R. Alston; Sgt. R. Anderson; Sgt. K. W. Barry; Flt. Lt. G. W. S. Borthwick; Flt. Lt. A. Boswell; Sgt. J. R. Bothwell; Flt. Lt. B. J. Brachi; Sgt. A. F. Brett; Sgt. L. R. Bright; Sgt. W. J. T. Brodie; Flt. Lt. R. J. Brown; F/O. P. R. Butler; F/O. H. L. W. Cairns; Sqn. Ldr. A. L. Collett, A.F.C.; Sgt. H. Cookman; F/O. L. W. Creasey; Sgt. P. N. Crutchfield; Sgt.

SERVICE AVIATION

V. Dooley; Flt. Sgt. G. Dove; P/O. J. H. Eastwood; Flt. Sgt. T. W. Elder; Sgt. R. C. H. Fisher; Sgt. E. J. Fletcher; Sgt. J. B. Foster; Sgt. R. C. Gardner; Sgt. R. G. Giddings; W/O. E. W. Green; Sgt. S. J. Groucott; F/O. T. D. Halbert; Sgt. K. L. Harding; Flt. Sgt. G. K. Harper; P/O. B. S. Harrison F/O. R. W. Heal; Flt. Sgt. C. Highton; Sgt. C. A. Hilder; Flt. Sgt. J. G. Hodgkinson; Sgt. G. R. Holland; Flt. Lt. K. T. S. Holmes; Sgt. P. Horsfield; Flt. Lt. H. R. Hyde; F/O. J. Inston; F/O. B. A. James; Sgt. D. E. James; Sgt. J. Johnston; P/O. L. G. Jones; Sgt. R. C. H. Jones; Sgt. T. M. Jones; F/O. R. P. N. Kayser; P/O. B. J. Kearley; Sgt. H. G. Lang; F/O. K. A. Leonard; Flt. Sgt. L. R. Lewis; Flt. Sgt. D. F. Ling; Flt. Lt. C. C. Lockyer; Sgt. T. K. McCash; Sgt. J. W. MacDonald; Sgt. J. J. McDonough Sgt. A. W. McKenzie; Sgt. R. McKerlay; Sgt. F. MacRae; Sgt. W. G. Mann; Sgt. A. J. Manthorpe; Flt. Sgt. J. J. Martin; F/O. H. Mason, D.F.M.; W/O. E. Middleton; Flt. Lt. E. Mirfin; Sgt. E. S. Monaghan; Flt. Sgt. L. V. Moran; P/O. C. W. J. Newman; Flt. Sgt. J. A. Newman; Flt. Sgt. E. J. Outram; Sgt. E. Parker; P/O. F. J. Peacock; Flt. Sgt. H. W. Phillips; Sgt. A. B. Porter; Sgt. E. R. Prince; Sqn. Ldr. G. W. Prior, D.F.C.; W/O. J. Pritchard; Sgt. A. Pulman. Flt. Sgt. J. C. Reynolds; Flt. Sgt. L. D. Richards; P/O. J. Riordan; Sgt. D. Robinson; Flt. Sgt. J. W. I. Robinson; F/O. W. B. Robson; Sgt. C. Royston; Sgt. R. J. Sampson; Sgt. L. G. Sandilands; Flt. Sgt. B. O. Savage; Flt. Sgt. K. J. Scales; Sgt. J. P. Seddon; Sgt. H. F. Shearsby; Sgt. D. L. Silverman; P/O. H. J. W. Smith; Sgt. J. F. Smith; Sgt. J. W. Smith; Flt. Sgt. T. W. Smith; Flt. Sgt. N. T. Steele; Sgt. R. A. Taylor; Sgt. F. E. Tidmas; Sgt. D. H. Tupman; Sgt. N. D. J. Vincent; Flt. Sgt. A. B. Walker; Flt. Sgt. B. G. Walsh; Sgt. R. W. J. Warren; Flt. Lt. G. A. Watling; P/O. J. O. R. Webster; Sgt. A. R. E. West; W/O. A. Whitehouse; P/O. R. Whitley; Flt. Lt. D. L. Williams, D.F.C.; Sgt. R. J. Winfindale; P/O. E. Wood; F/O. P. M. Wood; Sgt. A. T. W. Woolhouse; Sgt. W. F. S. Wootten; Sgt. A. E. Wortley.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. J. A. Phillips.

WOUNDED OR INJURED IN ACTION.—F/O. G. E. Billing; Sgt. J. W. Duncan; Sgt. S. Harris; Sgt. W. N. Harshorn; F/O. L. Knowles; Sgt. W. H. Price; Flt. Lt. J. P. Studer; Flt. Sgt. J. A. G. Wright.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. E. J. Potts; Sgt. K. W. T. Sutton.

MISSING.—P/O. T. H. Bastable; P/O. R. H. Burr; W/O. A. C. Cheese; Sgt. F. Cocksey; Flt. Lt. G. Cox; Sgt. G. Creaser; Sgt. J. B. Cuthbertson; W/O. F. E. T. Davy; F/O. J. G. Faragher; Flt. Sgt. C. D. C. Farlie; Sgt. S. R. Fenwick; Sqn. Ldr. H. C. Haley; F/O. A. E. Halliwell; Sgt. W. T. Hartland; Wing Cdr. J. H. Humphris; Sgt. D. J. Job; Flt. Lt. R. MacKenzie; F/O. R. Maden; Sgt. L. D. A. Mawson; Flt. Sgt. A. E. Meekings; F/O. C. I. Mitchell; F/O. R. B. Moore; Sgt. W. D. N. Morgans; W/O. L. Rourke; Sgt. A. Simpson; Sgt. G. A. Snelling; W/O. J. Southworth; Flt. Lt. K. E. Spence; Sgt. R. C. Starkey; Wing Cdr. N. J. Starr, D.F.C.; Sgt. P. Stead; P/O. J. F. Trickey.

• MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. J. Zita.

KILLED ON ACTIVE SERVICE.—Sgt. F. Bateman; Flt. Sgt. A. J. Bell; Flt. Sgt. V. Bell; Sgt. P. J. V. Browne; Sgt. W. F. Cairns; Sgt. E. C. Comer; F/O. J. R. Cramp; L.A/C. C. Cunliffe; L.A/C. F. A. Davis; F/O. L. F. Dowling; L.A/C. R. Edge; P/O J. T. Eshelby; Sgt. A. J. Evans; Sgt. J. V. Hay; Flt. Sgt. W. H. Johns; Flt. Lt. F. N. Johnston D.F.C.; Sqn. Ldr. M. V. Longbottom, D.F.C.; Sgt. F. W. Measures; Sgt. L. J. Miller; A/C.1 G. W. Nicholson; Sgt. A. A. O'Brien; Sgt. D. A. Ottaway; Sgt. W. R. Pike; Sgt. A. L. Sages; Sgt. R. H. Sedgley; Flt. Lt. A. R. Sims; L.A/C. J. Smith; F/O. J. S. Smith; Sgt. G. W. Stafford; P/O. H. J. Turner; Sgt. H. J. Williams; L.A/C. H. Williamson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. J. Broomfield. Sgt. K. W. P. Hunt; Flt. Sgt. D. W. A. Kersey; Sgt. F. L. Tucker.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 B. S. D. Berger; Sgt. F. Bulcock; A/C.1 J. A. Collie; L.A/C. A. D. W. Davison; L.A/C. J. H. Dean; L.A/C. V. H. Ireland; L.A/C. G. Rae; Cpl. A. A. Richardson; Flt. Lt. F. Rothwell, D.F.C.; L.A/C. J. Scott; Sqn. Ldr. A. MacC. Stott; L.A/C. H. Taylor; L.A/C. B. Towell; Cpl. D. G. Wain; L.A/C. C. E. R. Watson; Flt. Sgt. E. R. Wilkinson; L.A/C. J. W. Wood; L.A/C. R. C. Wood.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. D. Curry; L.A/C. W. L. V. Grist; Flt. Sgt. F. C. James; L.A/C. R. A. Norrie.

DIED ON ACTIVE SERVICE.—L.A/C. W. J. Hitchcock; Cpl. J. D. Magog; L.A/C. A. J. Robson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. R. K. Bailey; Sgt. W. J. S. Ballard; Sgt. L. L. Horler; Flt. Sgt. A. C. Noble; Sgt. E. W. Polson; Sgt. J. D. White; Sgt. K. Withnall.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Lt. G. A. L. Evatt.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. L. A. Denison; Flt. Sgt. G. C. French; P/O. C. A. Rose; W/O. W. B. Ryan; Flt. Sgt. R. O. Watts; Flt. Sgt. J. H. S. Young.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. H. J. Boal; Flt. Sgt. P. J. Bourke; F/O L. W. Bown; Flt. Sgt. W. E. Boyce; P/O. E. Brown; F/O. J. W. K. Cameron; Flt. Sgt. R. I. Cummings; Flt. Lt. J. R. Dodds; Flt. Sgt. S. G. Emery; W/O. A. J. Farrar; P/O. K. G. Feeney; P/O. A. R. Hart; Flt. Sgt. E. W. Hurley; Flt. Sgt. H. A. Jacob; P/O. J. A. Kerby; Flt. Sgt. D. H. Martin; Flt. Sgt. E. Oberhardt; Flt. Sgt. A. R. Patterson; W/O. R. J. Power; Flt. Lt. L. J. Robertson; Flt. Sgt. T. R. Rogers; F/O. L. M. Ryan; Flt. Sgt. F. R. Sampson; Flt. Sgt. A. H. Sawtell; Flt. Sgt. L. C. Taylor; Flt. Sgt. E. M. Thompson; P/O. S. Whiteside; Flt Sgt. J. F. Worley.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. K. McK. Anderson.

MISSING.—F/O. R. M. Herapath; F/O. V. M. Thomas.

KILLED ON ACTIVE SERVICE.—F/O. M. Larkin.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. J. Tudehope.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. P. G. Pfeiffer.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. L. A. Woodward.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. A. Divitcoff; Sgt. L. H. Janzen; W/O. A. E. Kurtzhals; W/O. G. W. Olafsen; Flt. Lt. J. M. Parrott; F/O. S. H. J. Pearce.

MISSING.—F/O. L. R. Belcher; F/O. H. P. Breier; Flt. Sgt. N. A. Butler; F/O. S. W. Elgie; F/O. H. C. Irvine; P/O. C. D. Mison; F/O. M. Strosberg.

KILLED ON ACTIVE SERVICE.—Sgt. E. A. Bishop; F/O. E. E. Fernandez; F/O. G. G. McGolrick; F/O. J. C. McLeod; Ft. Sgt. J. M. Penonzek; P/O. L. J. Robillard.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—P/O. P. B. Crosswell; F/O. T. W. Dowbiggin.

Royal New Zealand Air Force

KILLED IN ACTION.—W/O. J. S. McQueen.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. W. E. Kewley.

KILLED ON ACTIVE SERVICE.—P/O. G. R. Dunlop; Flt. Sgt. P. J. Hill; Flt. Sgt. R. L. Staples.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—2/Lt. D. P. McGee; Lt. J. G. Schuurman.

MODERN FLEET: An American naval/air task force on its way to make air attacks on Japan while standing some 300 miles off shore.

Air Transport Auxiliary

Third Officer L. C. MURRAY, A.T.A., killed whilst flying His Majesty's aircraft in England.

G. B. REGAN, A.T.C. Cadet, A.T.A., killed whilst flying on duty in His Majesty's aircraft in England.

First Officer D. R. HAYWARD, A.T.A., killed in an aircraft accident in England. (Australian papers please copy.)

Official Corrections

Casualty Communiqué No. 494.

Under "KILLED IN ACTION," P/O. E. T. Gillingham should read F/O.

Under "MISSING, BELIEVED KILLED IN ACTION," delete Flt. Lt. F. G. Grillage and W/O. F. H. Rapley. Under "MISSING" delete Sgt. J. Forward and F/O. W. A. Nicholls.

Under "KILLED ON ACTIVE SERVICE," Sgt. M. A. Oehrli should read Flt. Sgt.

Under "PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR," Sgt. R. P. Gigg should read Flt. Sgt.

Casualty List No. 495.

Under "MISSING," delete Sgt. H. Ainley, F/O. C. W. Cassini, Sgt. R. Egglestone, F/O. A. H. Hebblethwaite.

The following, under "MISSING," are now announced "KILLED IN ACTION": F/O. E. H. Baron, Flt. Sgt. R. Hall, W/O. H. W. J. Hildebrand, Sgt. R. C. Hitchen, Sgt. R. Holden, Flt. Sgt. H. B. Jones, F/O. B. M. Twilley. Delete Sgt. H. W. Wagner.

Casualty List No. 496.

Under "MISSING," delete F/O. E. Barratt and Sgt. A. R. Powell and insert under "KILLED IN ACTION." Delete F/O. R. C. Amey, Flt. Sgt. L. Jackson, Flt. Sgt. K. Kenworthy, P/O. E. C. Peek, Flt. Lt. R. F. Plant, Sgt. W. N. Stevenson, Sgt. A. Tweddle, Sgt. R. H. Webb, Flt. Lt. J. D. White, P/O. R. S. Winton, and P/O. A. E. Wykes. Alter Sgt. G. M. Clark to read Flt. Sgt. G. M.

Delete heading, "MISSING, BELIEVED KILLED ON ACTIVE SERVICE," and Cpl D. Wood.

Under "PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE," delete L.A/C. J. A. Smith and insert under "DIED ON ACTIVE SERVICE."

Under "PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE," delete F/O. R. W. Murphy and insert under "KILLED ON ACTIVE SERVICE."

Under Royal Canadian Air Force "MISSING," delete F/O. W. H. Dunwoodie.

Under R.A.A.F., "PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR," F/O. T. J. Lynch.

Under S.A.A.F. "KILLEDI IN ACTION," 2/Lt. Stork should read 2/Lt. O.

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